

# SUPPLEMENT.

# The Mining Journal, RAILWAY AND COMMERCIAL GAZETTE;

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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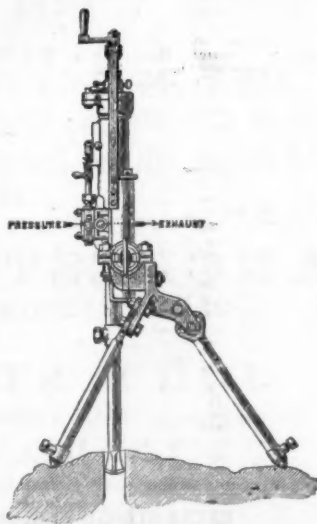
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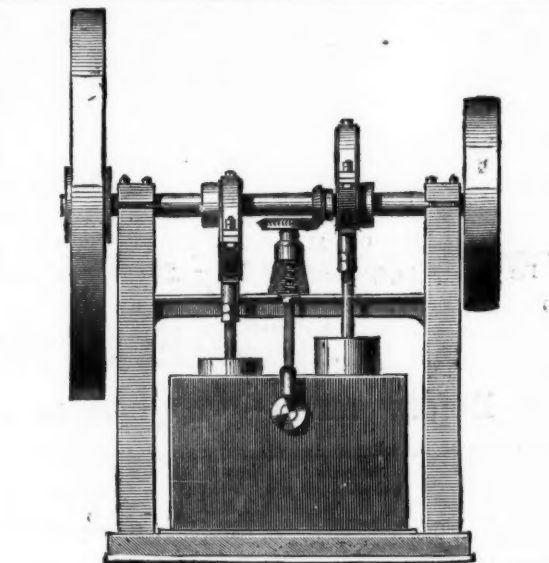
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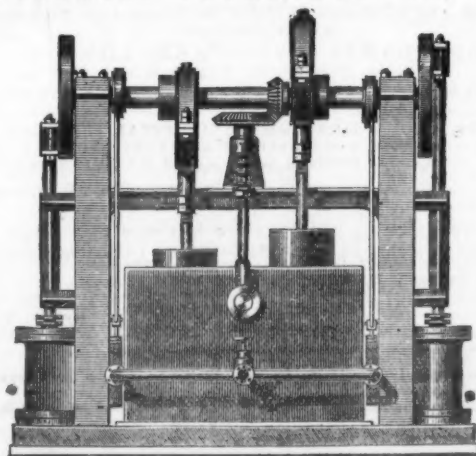
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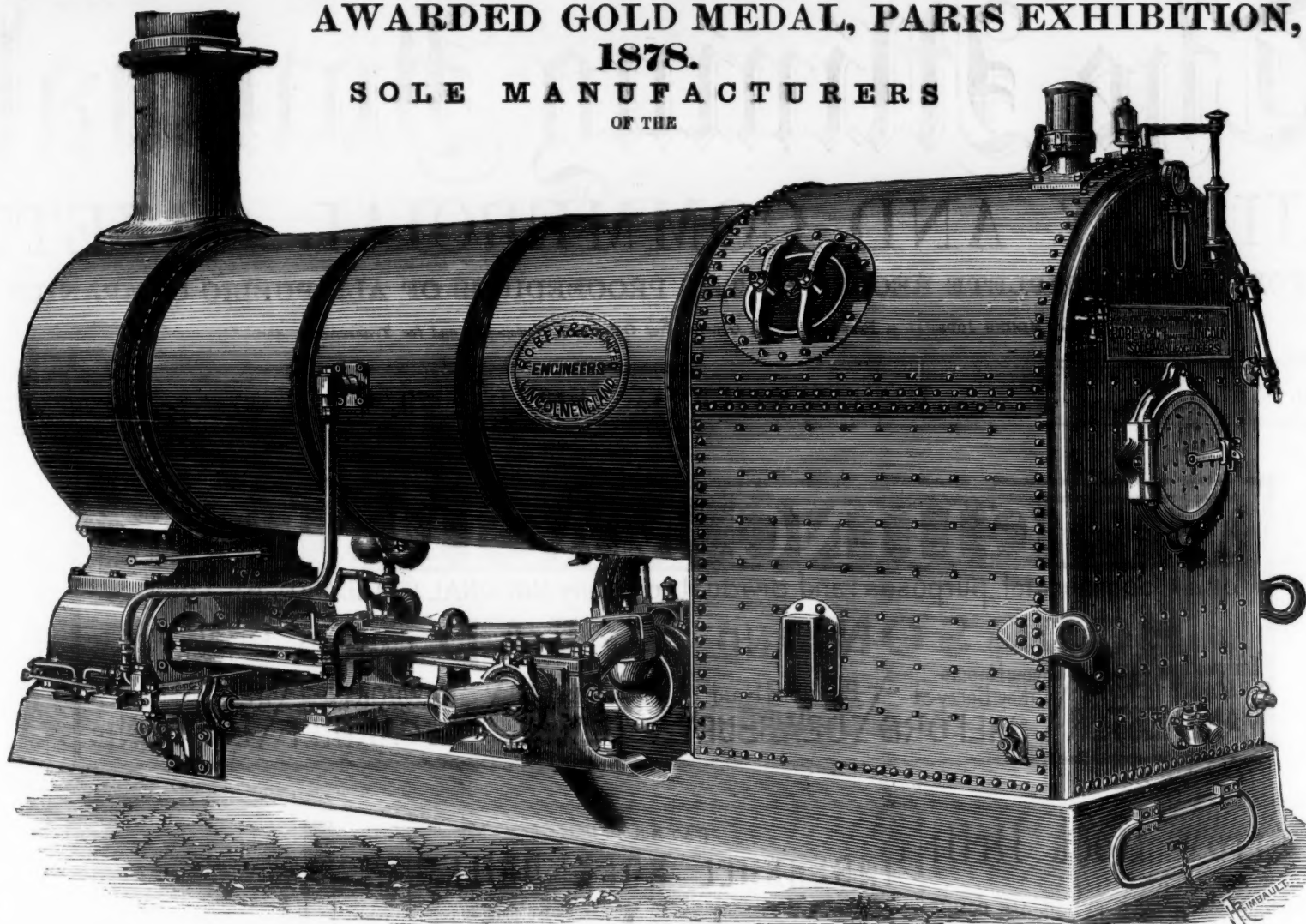




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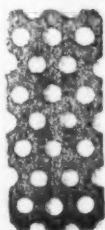
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## Original Correspondence.

## RAPID DEVELOPMENT OF MINES—BEAUMONT DRILLS

SIR,—It will, no doubt, interest many of your readers, particularly those who may be engaged in the rapid development of mines, to know the actual distances driven with the Beaumont drills during the past week. So far as I know, such results have never before been obtained with four drills.

At the Lees Moor Tunnel, near Kighley, under construction for the Bradford and Kighley Extension of the Great Northern Railway, the heading—8 ft. by 10 ft.—was advanced 34 yards in the working days of last week, the strata being the Yorkshire sandstone. In the same time in the Halkyn Tunnel 25 yards were driven.

The Halkyn Level is in the hard mountain limestone of North Wales, and is not now on any vein. The first section of the Halkyn Tunnel is approaching completion. About 200 yards—say, two months work—remain to be driven to carry the level under the South Pant-y-go shaft, at or about which point it is anticipated that the first water will be tapped.

I venture to think that the possibility of opening up ground at such speeds as the above cannot fail to be of the highest importance to the mining interests, especially as soon as the metal markets begin to show any signs of returning vitality.

Westminster Palace Hotel, July 8.

FRED. BEAUMONT.

## NEW SOUTH WALES—MINING SYNOPSIS FOR 1878.

SIR,—The Report of the Department of Mines for the year 1878 shows that the aggregate output of minerals exceeds that of the two preceding years, and that, notwithstanding the decline in the price of copper and tin, the aggregate value of our minerals for 1878 exceeds that of the two preceding years likewise. It is true that the quantity of gold won in 1878 is less than in any year for some time past, but this fact may be ascribed to the following amongst other causes—that during the early part of the year gold mining was almost at a standstill in consequence of insufficient water supply, the result of the long-continued drought, which, in fact, did not break upon some of our gold fields till nearly the latter end of the year; that many of our miners had been driven to seek employment in other channels, or had been impoverished to such an extent that they were unable, when the rain did come, to carry out the work necessary to secure the full benefit of an ample supply of it; and that in our newly-discovered gold fields, where the auriferous deposits were really rich, there was not only a want of machinery, but also an inadequate supply of water for crushing purposes, leave alone washing. The year, however, has not been absolutely uneventful; and, considering all the circumstances, the result shown by the following decennial returns is, perhaps, less discouraging than might have been expected:—

Return showing the Quantity and Value of Gold, Silver, Copper, and Tin produced during the last ten years, and of Coal during the ten years ending December 31, 1877, in the Colony of New South Wales.

Year.	GOLD.		SILVER.		COPPER.		TIN.		COAL.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
1869	251,432	974,149	7,500	18,750	2,084	76,675	—	—	1,415,720	0
1870	240,858	931,016	8,580	21,450	2,084	76,675	—	—	1,341,153	0
1871	323,610	1,230,455	14,700	36,750	1,444	88,876	—	—	1,080,751	0
1872	361,785	1,395,175	17,850	44,625	1,452	105,888	—	—	2,222,187	0
1873	270,823	1,040,329	12,100	30,250	2,846	105,888	—	—	2,684,935	0
1874	270,823	1,040,329	12,100	30,250	4,169	165,140	—	—	2,687,315	0
1875	230,883	877,694	15,997	39,992	3,677	149,973	—	—	2,575,625	0
1876	167,412	613,190	18,963	47,408	3,275	129,973	—	—	2,154,100	0
1877	124,111	471,418	24,371	60,927	4,513	182,226	—	—	2,309,706	0
1878	119,353	428,753	11,890	29,721	5,019	205,269	—	—	2,248,875	18
	2,515,457	9,625,821	137,299	354,074	29,470	1,115,565	41,983	2,771,888	21,200,367	18

You will observe what a steady increase there is in our coal and shale productions—for now that Newcastle Harbour is improved and deepened, and the shipping appliances such that there is no delay, many foreign vessels call in and load on ships' account; and as our Walsend coal is now proved to be superior to any other in any part of the world (except the very best English), it always commands a price; and now that steam is being introduced in the South Sea Island trade, we shall have, of course (practically), the monopoly of the trade for the whole of the Pacific besides our usual Eastern, China, and American trade, and with the yearly increasing traffic our coal trade alone will help to make New South Wales one of the most prosperous of the Australasian colonies.

During the year not only has the Barrington gold field been so far tested as to prove that it must contain a considerable, if not even an enormous, extent of auriferous deposits, but it may be said to be a permanent field, as several of the veins have been worked to a moderate depth, and so far have increased in size without any falling off in the yield of gold, whilst new gold-bearing veins have from time to time been discovered, extending over a very large area. It will be some time before sufficient machinery will be on the ground to crush all the stone that can be raised, but now that the permanence and richness of the veins are considered to be established, the appliances will doubtless soon be ample, and we may then hope to feel the full benefit of this new and really important field.

Another important discovery made during the year is the exist-

ence of rich silver lodes at Boorook, in the northern part of the colony. Up to the present time very little of the ore has been treated, owing to the absence of proper appliances for reducing it and for profitably extracting the metal. Added to this, the miners in this colony have no experience in the treatment of silver ores, and neither know what kind of machinery is necessary, nor how to use it if they had it. A number of samples of the ore have been tested by the Mining Department, and the following are the results as contained in the official (preliminary) report of the geological surveyor, sent up by the Mining Department to examine the field:—

## THE BOOROOK SILVER MINES.

Mr. Lamont Young, mining civil engineer, sends the following report on the Boorook Silver Mines to the Under-Secretary for Mines:—

Oaklands, Mittagong, April 20, 1879.

SIR,—In accordance with your desire that I should give you a brief opinion on the Boorook Silver Mines, pending the elaboration of my notes into a report on the same, I have the honour of submitting the following:—

The Boorook Silver Mines are situated in hilly country some 23 miles to the north-east of the present town of Mittagong, and are approached by one following the main road into Queensland as far as Boonoo Boonoo where, as a bridgehead, it strikes off through the bush; and the other along a very fair coach road, crossing Sandy Creek. There is, however, no bridge over the latter, and in flood time this road is closed. The relative lengths of these roads is estimated at 27 and 29 miles. Whilst I was at Boorook a new route was said to have been discovered from Stanthorpe to Boorook, but this also will be impassable in flood time unless one or two bridges are built.

A large quantity of ground has been taken up in leases. The population, now about 200, is rapidly increasing. There is a large store, a post office, a public house, and many tank buildings; and the survey of the village, water, and camping reserves is being proceeded with.

The lodes are situated in belts of felspar-porphry, alternated with beds of altered and fossiliferous shales of Devonian age. There have been a considerable number of lodes discovered, but in nine instances only have any explorations worth mentioning been prosecuted, and these are of slight extent. Thus the Golden Age (the only claim from which stone is being crushed by machinery) has two shafts down, 75 ft. and 50 ft., the driving north and south from the 50 ft. shaft being 22 ft. and 18 ft. respectively. No. 1 north has a shaft down 40 ft. No. 1 south a shaft 30 ft., and have begun driving north; No. 2 south, a shaft 25 ft. The Addition Reef prospectors claim, one shaft 50 ft. deep; No. 1 north, a shaft 15 ft. The Golden Crown prospectors claim a shaft 55 ft.; the Grand Junction prospectors claim two shafts 30 ft. and 18 ft. respectively; the John Moffatt prospectors claim one shaft 12 ft. There are also old workings executed seven years ago in search of gold on the Happy Valley (Hurley's), the Robinson's, the Nil Desperandum, the Copenhagen, and the Mariners' lines of reef.

The stone from all the new workings has been found on burning in the forge to show more or less metallic silver, though the lodes in one or two of the claims are not looking so well as they did at first. Some of the burnt stone is so highly coated with silver buttons that it is well to bear in mind that such specimens are most likely picked ones.

I subjoin a list of assays from some of the claims made by the Department of Mines:—

	Silver per ton.		Gold per ton.	
	oz.	dwt. gr.	oz.	dwt. gr.
Addition Reef	522	2 0	18	2 10
Addition Reef (50 ft. level)	42	10 0	0	19 19
Addition Reef, No. 1	1	4 0	0	0 5
Addition Reef, No. 2	20	8 0	0	8 10
Golden Age Reef	50	1 5	0	9 14
Golden Age Reef (50 ft. level)	95	16 19	1	4 0
Silver Age Reef	18	19 0	0	9 14
Golden Crown	459	16 10	5	11 14
Alderman Reef	370	15 14	0	9 5
Woolshed Reef	5	10 14	0	0 19
New Claim (Golden Crown Reef)	0	3 0	0	8 19
ditto	0	6 5	0	5 10

There are besides four or five lodes, the outcrops of which have been opened on, and some of these, notably the North Pole and the Clifton, have a favourable appearance. The general strike of the lodes is north and south, with a slight dip to the west.

From the above it will be seen that silver-bearing stone has been discovered over a considerable tract of ground, but that though the lodes have been found to be highly argentiferous in places, they have only been prospected near the surface.

The silver-bearing minerals are very much disseminated through the matrix of the lodes; a preliminary examination seems to point to argentite as the chief source of the silver. There is also red silver ore, iodide and chloride of silver, but the result of the analysis now being made will make this matter clearer. The associated minerals are iron pyrites in considerable quantity, free gold, copper pyrites, oxide of iron, quartz and chlorite, the latter mineral in some cases, as in the Golden Crown Reef, forming the walls of the lodes.

The silver is only being extracted by Messrs. Horton and Co. Their method of treatment is as follows:—The ore is crushed in bulk, as extracted, in a three-stamp battery, the gratings on the stamp boxes having 140 holes to the inch. The crushed material is collected in settling pits, and then treated in Wheeler's pans, the charge being  $\frac{1}{2}$  ton of ore, 6 lbs. of salt, and a little sulphate of copper and mercury (the amount used was unknown), the resulting amalgam is returned in the usual manner. The result of this process is that about one-quarter of the silver in the ore is extracted, and a considerable quantity of mercury lost (in the form of calomel). I am unable to state exactly the percentage of silver extracted from the ore by this process, as the requisite assays have not been made, but this information I hope to supply in my report.

It is my opinion that the Freiberg system of amalgamation in barrels will be found to be the best, and that a preliminary sorting and dressing of the ore will be advisable, and in my report I hope to furnish diagrams of the best apparatus for this purpose. I cannot, however, speak with certainty on the subject of the extraction of the silver from the ore until I have had the results of a series of analyses now being made.

From the small size of the claims it would be inadvisable that each should treat its own ore, but rather sell it to some company who could perform the operation on a large scale.

In conclusion, I would briefly repeat that though rich silver ore has been proved to exist in places widely separated, though the rocks in which the lodes lie are of a favourable character, and the prospects of Boorook on the whole very encouraging, still the lodes have not been proved to any depth, and that till such is done it would be inadvisable for any large capital to be risked.

With the requisite skill and appliances this field should largely contribute to our mineral products, and as the ore to all outside appearance greatly resembles that of the celebrated Comstock lode in America, we may yet possibly rival that "Mammoth of Mammon" which has made Nevada a second Potosi.

One of the most promising gold fields is the Yalwal down to the southward, situated in the agricultural district, and the claims principally held by local farmers and a few miners. The reef is about 3 ft. generally, but widening out in places to 16 ft., and in some places there is almost a quarry of it. In the latter case the yield is from 2 up to 12 dwts., but the reef gives from 1 up to 2 $\frac{1}{2}$  ozs., and if it proves permanent with depth will be one of our best gold fields, as it is well watered, easy of access, and easily worked.

Hill End is also looking up again, as some very fine specimens have just been got at the 720 ft. level, and the whole body of stone greatly improved within the last few days' work—in fact, there have been good yields and good finds lately from all our gold fields, and as we are all pretty well seasoned now there will be very little chance for any more swindles being floated again; and as during the last few years (since the collapse of our mining mania of 1872) the railways have made access to our different mining districts both easy and cheap, our investors can now go and see how their capital is being dealt with, and hence there is every prospect now of legitimate mining succeeding and becoming a permanent and recognised industry.

Luckily for the colony we now have a thoroughly experienced Mine Department, and Mr. Harrie Wood, the under secretary, is not only an able administrator and gentleman of long and varied experience, both here and in Victoria, but also takes an intelligent interest in the general public profiting by the special information sent in by his inspectors, and has also arranged with the Minister for Mines that the Government Geologist, Mr. C. S. Wilkinson, F.R.G.S., may be allowed to inspect and report on mineral properties for private investors (on their merely paying his travelling expenses), and this alone will almost completely check any more swindles being foisted on the inexperienced, especially also as many of the local warden—such as Mr. de Boos, Mr. Slee, Mr. Manton, and others—have a good knowledge of minerals and mining, and, therefore, can keep the head office well posted up in all essential points regarding their respective districts.

The reports from the officers of the Mining Department show an improvement towards the end of the year in most of our mining districts, but it is scarcely possible with so small a number of miners, and so little capital invested in mines, to do justice to our extensive and wide spread mineral deposits. There can be little doubt that few better fields for investment of capital can be found than are presented by our silver lodes, copper lodes, tin fields, and gold reefs, whilst our coal and shale speak for themselves.

With the enormous quantity of iron we could shortly use up in rails for over 1000 miles of railway extension, and the pipes for our large water and sewage works shortly to be commenced, our extraordinarily rich iron ore, coal, and limestone deposits at Wallerawang will probably now be worth utilising at last, as, according to Prof. Liversidge's report, there is scarcely a richer (natural) iron mine in the world.

In conclusion, as an evidence of the mineral wealth of the Australasian colonies, an incomplete return recently compiled (and except as to this colony and Victoria brought up to the end of 1877 only)

shows that the value of our minerals already reaches the large sum of 307,043,797. One word of warning to possible English investors—let them insist on seeing a Government report, and in all cases insist, as far as possible, that the vendors sell for paid-up shares, and receive no cash beyond bare cost of plant or work done, and with these reasonable precautions there is probably no better, safer, or more profitable field for investment than New South Wales.

Sydney, New South Wales, May 29.

R. D. ADAMS.

## SLATE QUARRIES IN GERMANY.

SIR,—The production of slates in foreign countries and the possibility, or more the probability, of such slates competing with what we have been accustomed to deem our peculiar industry is a question of considerable interest.

Having, therefore, recently had opportunities of examining slate quarries in the German Empire, and of considering the question generally as affecting that country, I have thought that a few remarks on the subject may not be unacceptable to the readers of the Mining Journal.

The strike or course taken by the different geological formations in this country from N.E. to S.W. or thereabouts is the same on the Continent of Europe; consequently, the slate ranges run in the same direction as that of those of North Wales, as shown on the map accompanying my work on Slate and Slate Quarrying.\*

Leaving out for the present the slate quarries of the Palaeozoic outline of the Hartz district we have for some distance running N.E. and S.W. across the Rhine a trough filled with newer strata, the underlying older strata, which contain slates, rising to the surface on each side.

On the north-west side—the side nearest to us—this outcrop of older rocks passes from the north of Dillenburg and the country north-east of Siegen down to the Rhine, which it crosses about midway between Coblenz and Bonn. From this point it is continued south-westward into the wild rugged country of the Ardennes, on the confines of France, Belgium, and Germany, where slate quarries have been worked for ages.

The further, or south-eastern, outcrop runs along the range of the Taunus Mountains, famous for their mineral waters, to the Rhine, by Caub, where there are extensive quarries. It is continued along the Hunsrück Mountains to the Hochwald, near Treves, where we shall see there are also slate quarries of great capabilities.

The order of the strata as seen along the north-western outcrop in the Ardennes and on the borders of Germany and Belgium is as follows, in descending order:—

1. The Mountain or Carboniferous limestone—Système calcaireux supérieur.
2. A group of flagstones and earthy slates—Système quartzschisteux supérieur. Probably Upper Devonian.
3. A lower group of limestones—Calcaireux inférieur. Probably Middle Devonian.
4. A series of grits, flagstones, and slates much complicated—Système quartzschisteux inférieur. Lower Devonian.
5. Upper division of the Terrain Ardoisier, or slaty strata of the Ardennes, consisting of fine roofing slates, alternating with beds of quartzite, and passing downwards into—
6. The oldest crystalline slate-rocks of the Ardennes, answering to our Cambro or Lower Silurian, if not our Cambrian strata.

At the north-eastern end of the north-western outcrop in the neighbourhood of Dillenburg a series of black slates belonging to No. 4 are seen to rise from underneath the limestone No. 3.

These are known as the black slates of Wissenbach, and they are quarried on the slopes of the hills, which form the southern side of the valley in which the village of Wissenbach is situated.

The dip of the beds here is about 60° to the south-east, and the cleavage planes cross the bedding at an angle of 15° or 20° in the same direction. The bedding is seen in the obscure undulating lines that cross the slates. These lines widen out, however, sometimes, and are filled with pyrites, which partly consist of and are crowded with organic remains beautifully preserved. The quarrymen know the value of these, and they take the good specimens home, where at their cottages travellers so disposed may purchase them.

The same slates are also quarried to a considerable extent about Brilon and Meschede, further to the north, and here they do not contain the bands of fossils as at Wissenbach.

The roofing slates of No. 5 are largely quarried in the Ardennes, and numerous quarries may be seen in the wild district traversed by the railway from Brussels to Luxemburg, between Namur and the latter town. The slates are of a nice blue colour; some of them stand the weather well, but others, after they have been on roofs some time, become dark and mossy—but that there is a good quantity of slates of excellent quality in this region there cannot be any doubt.

Although the age of the strata has been questioned it is probable that this is the same group of slates as that quarried along the south-eastern outcrop of the trough in the Taunus and Hunsrück Mountains—the most important quarries being those of Caub, on the Rhine, and those near the village of Casel bei Treves, with numerous smaller quarries along the Moselle and between that river and the Rhine.

The quarries at Caub are extensive, and have long been in work; but, perhaps, the best illustration I can give of the structure and quality of these slate-beds may be found in one of the quarries near Treves.

There are several quarries in the vicinity of Casel bei Trier—the slates being carted daily to the Moselle and to the railway station at Treves. The most important of these is the Süss-Casel Slate Quarry, which is worked by a private gentleman, Herr P. Süss, of St. Paulin bei Trier.

The quarry is situated about three-quarters of a mile above the village of Casel, on the borders of the Hochwald. It has been opened where the strata having risen up from underneath the trough filled by New Red Sandstone, which is so well seen on the left bank of the Moselle, rise up into hills at an angle of 45° or thereabouts from the horizon. The cleavage planes cross the dip, and incline to the S.E. at an angle of about 10°. It would thus seem as if the angle and direction of the cleavage were similar over a large area.

As far as already proved there are three distinct beds or bands of slate, which run nearly N.W. by S.E. The first or north-western of these is 23 yards thick; it is separated from the second, which is 20 yards thick, by a mixture of slaty rock and quartz 17 yards thick. This is underlain by a thin band of quartz and slaty rock, and then comes slate band No. 3, which has been worked to a thickness of about 15 yards, but which is evidently of very great width.

The whole of these slate beds are of similar character, and all show the lines of bedding crossing the split. They are of a uniform good blue colour, and look well upon the buildings of Treves and the neighbourhood. They are free from pyritous matter, and have a straight and even split. Thus far the average thickness of the manufactured slates has been four to an inch, but the material admits of five being made of the same thickness of rock. They resemble a good deal the best slates made from the "back" or barred vein as worked in Maenoffen Quarry, Festiniog, or those from the Rhinewarth Quarry, Llanygog, only not so heavy as these latter. For size the blocks will make a fair proportion of English average size.

The quarry is situated on the face of a steep hill, and has in time past been worked partly as an open quarry and partly in chambers underground; but the present spirited proprietor has had the quarry laid out for extensive systematic underground working.

The slates from this district are now used in Treves, Saarlouis, and the towns along the Saar and Moselle. They are sent also to Strasburg and the Süss-Casel Quarry is rapidly opening up a trade with Cologne, Aix-la-Chapelle, Düsseldorf, and the towns of the Netherlands generally. The trade will probably extend to the Dutch and Baltic ports, where it will come into competition with our slates.

In the matter of slate quarrying and the dressing of slates the Germans have yet a good deal to learn. Unlike ours their underground chambers are worked by overhand stoping. They are not arranged according to any system, are worked to a very limited extent, and then abandoned—the rubbish being thrown upon the good

\* CROSBY LOCKWOOD and Co., London, 1878.



slate rock below. Hence the cost of mining is very heavy in proportion to the slate rock excavated.

The economical habits of the people have also led them into an error. So anxious have they been to utilise every scrap of slate that they have contracted a liking for slates of a small size, and actually break up blocks that would make slates 18 by 10 into their little ornamental slates. They also make a great number of undressed slates, some of which have, however, one curved side or end. These are laid on the roofs diagonally, the lower curved edge of the slate only being seen—the other edges of the slate which have been left to take care of themselves being covered. It must be confessed that the slaters make a good roof out of such small slates; but this does not do away with the absurdity of making big slates into little ones.

In splitting, the man kneels all day long, a three-legged stool being fixed over his legs, on which he bends back and sits. The slate block is held between his legs, and in this constrained posture he sits from 6 o'clock in the morning until 6 or 7 o'clock at night. Excepting the slates which are made six square he does his own dressing also, sticking a slate up on edge, and trimming on it the one in his hand with the side of his splitter. So it will be seen that, notwithstanding the advantage the German quarry owners have of low wages and long hours, they will have to adopt better methods and more division and concentration of labour before they can compete with English slates. Conservative as they are of their own old methods I have no doubt they will learn to do this in time.

The wagons, too, in which the slates are conveyed to market are of the most primitive kind—such as one only sees here now on remote Welsh or Scotch farms; and hence the contrast is great between them and the wagons and teams, for example, which traverse the road between Beddgelert and Portmadoc daily, or the traction engine with its train of wagons that plies between Llangynog and Porthywen. But they will learn in time.

It will be inferred from these remarks that few of the German quarries have railway connection, and this is so. The peasant proprietorship of the country with the splitting up of the land into so many properties, whatever its other advantages may be, is a hindrance to this. Indeed, the peasant proprietors are often found to be very obstructive and unreasonable. But the Government is anxious to have the mineral resources of the country developed, and it gives every help and facility possible to spirited adventurers like the owner of the quarry I have named. Hence, save nominal rents for Crown or public lands, there are no royalties to pay.

The slates worked in the quarries of the Hartz seem to correspond to those of Wissenbach and Brilon, while those of Silesia and Moravia seem to be the equivalent of those of Camb and Casel.

There is no doubt that the slate resources of the German Empire are good; but, notwithstanding that some of the quarries have been worked for ages, slate quarrying there as a scientific systematic industry is in its infancy.

D. C. DAVIES, F.G.S.

Ebnal Lodge, near Oswestry, July 6.

#### THE MOUNTAINOUS DISTRICTS OF ASTURIAS AND LEON.

Sir,—The inhabitants of these districts are primitive in their customs, being but little advanced from the simplicity of life in olden time. Throughout the week the men lead their flocks to pasture to a distance, taking with them the necessary provisions, and sleeping as best they may, whilst the women and children till and cultivate their respective tracts of land, and spin, weave, and sew together the clothes required by themselves and their families. All wear clothes manufactured out of the black wool of their own flocks in the home loom (which, owing to its natural colour, has at all times a very dirty appearance), and of the hemp and flax grown in their own fields. In addition the men wear an outward covering of goat and sheep skin in its natural state, only sun-dried, and fitted in an original style, with caps of the same material. All wear on their feet shoes made out of one piece of wood, large, heavy, and clumsy, but which seem to be used without any inconvenience even by the young who are only just beginning to crawl. The females wear in addition a brilliant bodice of cotton stuff, and on their heads for a covering a large dark-green, or blue and yellow, cotton kerchief, tied in such a way as to leave a long end hanging over each ear. All the women wear earrings of some description; and that farmer's wife or daughter is considered the richest who can afford to wear the largest earrings, which are often so heavy and clumsy as to necessitate their being suspended by a piece of string of some description being passed and looped round the ear. To distinguish Sundays and holidays the handkerchief and bodice are of a more brilliant description, and leathern shoes of very original make replace the wooden ones; the men also change these, doff their sheep and goat skin coverings, and when feasible replace the skin cap by a felt hat, and nothing more. Houses are often occupied by both shepherd and flocks, the latter occupying the ground floor, as a matter of course. Architectural beauty is not considered, nor convenience, even to the extent of closing crevices in the dry stone-built walls of many of the houses to exclude winter blasts, otherwise than by a daub of mud; and although there is such a vast abundance of limestone, few think it worth their while to construct a kiln even of the crudest form to burn it, with a view to the general supply of the same. There is an abundance of good water everywhere, but it is seldom used, other than for the purpose of watering the flocks, irrigating, and for culinary purposes. There seems to be a horror of it as a cleansing agent, and doubtless there are those in Asturias, Galicia, and the north of the province of Leon who could not remember ever having been washed, otherwise than through being drenched by rain.

The disposition of these people in general appears to be deceitful, selfish, vicious, very superstitious, and imbued with religious fanaticism, being led and governed in all things by the Padre Cura of the village, who, unfortunately, is far from being a type generally of either wisdom or virtue. Throughout the whole of these districts there is not one sign of advancement or progress; everything seems to be at a complete standstill; money is rarely seen or used, barter being its substitute, and when used only in the smallest equivalents, the cuartos and ochavos being the ofttest seen.

Nevertheless these districts teem with mineral wealth, and are not superseded by many known spots on the earth's surface. On the northern portion of the province of Leon we find lodes of cobalt in the state of a black earthy oxide, cropping to the surface, samples of which often yield 15 per cent. metallic cobalt (the geological formation in which it is found being the Triassic, and the beds of the lodes magnesian limestone, or dolomite), also nickel in the same state, and copper oxides, carbonates, and sulphurets in abundance. Towards the north-west of the province lie the native silver mines of the La Roja district, and also argentiferous copper mines; the former were worked to a considerable extent prior to the end of the 15th century, when they were closed, and re-discovered in a curious manner only some three years ago. The reason of their having been closed was that upon the discoveries of Pizarro in South America being made known, and duly appreciated, the closing of all the valuable gold, silver, and other mines throughout the Iberian peninsula was decreed by the Spanish Sovereign, and all miners commanded to emigrate to the newly discovered colonies. Of course a record of all the valuable mines was kept, but the greater portion of this record was lost during the revolutions and invasions that have ensued from that time to the present. A small portion of them have been saved. Amongst these was found the description and boundaries of a famous native silver mine, which had been very successfully and extensively worked prior to the decree for its closure having been promulgated, together with the distinctive marks to find an entry into it. These notes fell into the hands of a man who had been a successful contrabandist for a time from Portugal into Spain, who thereupon determined to become a mine proprietor. He went to the spot, discovered the entry into the mine, verified the certainty of its value, registered it according to the Ley de Minería, and to day holds its title in perpetuity, subject of course to the conditions of the said mining law. The writer has seen and examined, in its owner's possession, samples of pure native honeycombed silver, cut by him at the time of its discovery.

In a certain spot in Asturias the bed of a rivulet consists for some

distance of disintegrated quartz, containing a quantity of small grains of gold in its whole extent, and some distance from that spot there appears to be a crop of quartz reef, from whence undoubtedly the alluvion has been disintegrated and carried to its existing position. It is within the writer's knowledge that some of the gold from the bed of the rivulet was extracted by washing, and sold to a goldsmith at Santander. No workings of any description are to day being carried on there, owing to the fact that the parties who know of it, and who have it, are at present distant from the spot, and can neither procure the funds for travelling nor the necessary materials for working, owing to their desire not to divulge its whereabouts.

Near this same spot there is an extensive deposit of manganese, containing gold finely disseminated in it. Samples assayed gave 1 drachm of gold to the quintal of 100 lbs. of the ore. That there has been a large quantity of gold worked in the districts under notice is a fact that is very often proved by the finding within these districts on many occasions quantities of gold unworked. The following incident may serve as one instance, more particularly so as the principals thereto are now living. Upon one occasion one of the inhabitants of a small village in the north of the province of Leon was engaged, in company with his servant girl, in digging up a small plot of ground on the mountain side, prior to planting it with vegetables. The girl whilst so employed struck her hoe against something which seemed different to the soil she had to that time turned up, and which appeared to be a parcel of some kind wrapped up in leather. On calling her master's attention to it he forbade her disturbing it (undoubtedly guessing it contained treasure, or something else of importance), and sent her to dig elsewhere, which she did. Being possessed of very slow imaginative powers of perception, it did not strike her as strange that her master had given such orders, until that night, when it gradually dawned upon her senses that there might be more than she had been able to see; and, consequently, after spending the night deliberating upon the probabilities of the case she rose very early in the morning, and with hoe in hand proceeded to the spot. But, alas for her hopes, she found that somebody had been before her, and that of the bundle nothing remained but a portion of the covering rotted from age. Upon her taxing her master with having found something, and claiming a share, she was summarily dismissed his service, with nothing for her pains. Some time elapsed without a sign, except several trips to Leon, the capital, which very greatly surprised the whole neighbourhood. Since it was not the custom of these people to travel further than from the mountain top to the valley and back. Then two very fine farms were purchased with stocks and all, and paid for in hard cash. This very much surprised the neighbours, as the said farmer had during his whole life found a difficulty in making the two ends meet. A short time afterwards, a heavy fine having been imposed by a local tribunal, it was paid in gold ingots. Enquiry was instituted as to where the farmer had obtained them, without any result; but it is a fact that the son was sent to a high school, and educated for the law, and to day practises as a lawyer, when not engaged in his other capacity of deputy to the Cortes at Madrid. Such is the matter repeatedly told the writer, who has often met the deputy, as well as other members of the family.

Within a short distance of the auriferous manganese deposits there exists a very fine lode of asbestos, which could readily be worked, with a result of only about 15 per cent. of small and short. This lode crops to the surface, and to the present time has never been worked.

In the same district there is a very fine deposit of copper pyrites, of from 9 to 10 ft. in thickness at the crop, and of about the same percentage as that of the Rio Tinto and Tharsis mines, at Huelva, and the mines of Carracedo, which to the present time have only been worked to a small extent by the native proprietors.

Ironstone containing about 52 per cent. of iron practically free from sulphur and phosphorus abounds in immense deposits, as well in the north and north-west of the province of Leon, as throughout the Asturias; a hematite ore containing the above percentage of iron, with a maximum of about 5 per cent. silica, being found at a short distance from the port of Rivadesilla, in such quantities as to be practically exhaustless.

Coal in vast abundance also exists. Anyone who has travelled by the North-Western of Spain Railway, from Leon to Gijón and Oviedo, could not have failed noting the crops of coal through which the railway cuts. To a very small extent it is being worked in the district of Pola-de-Gordon, which is the southern crop of this field; on the northern side, distant about 15 miles, close to the village of Rodiezmo, and within a mile of the Villamanin Station upon their line, a shaft has been sunk by the railway company, cutting four fine veins of coal, which were all found to be workable, but owing to the financial difficulties of the company, and the seizure of the line by the Government as the most important creditor, no further work had been done up to September of last year. The shaft, which carries in its interior a spiral staircase of cut stone, with iron hand-rail, for the use of the miners, has been left to become filled with surface and rain water. These coals have been proved to be of excellent quality for locomotive, gas, and smiths' purposes. Only a small part of these coal fields and ironstone deposits have, up to the present, been registered as mines, and of the latter only sufficient work has been done as has been found necessary to supply Miers' works and a couple of Catalan forges with mineral.

Could English manufacturers be induced to spend some of their leisure time in these districts instead of rushing to other parts of the European continent they would, doubtless, see the advantage of transferring there a small percentage of the enormous capital which they at present sink in the manufacture of iron and steel in England, since they would have upon the spot, and free of other royalties than the Government nominal annual ground rent of five escudos or 10s. 5d., per 10,000 square metres of superficies, the ores of good quality, limestone in abundance, an unlimited supply of coal, which will make an excellent coke, water in plenty, and sufficient room to move in without fear of encroachment upon the boundaries of neighbours and others. Add to this easy communication with the coast and the interior, cheap labour, a ready market in the country for the whole of the manufactured article, mining and manufacturing laws that are acknowledged to be the easiest and fairest of any country, and a climate that can rarely be surpassed for its health-giving qualities, and, further, an abundance of fishing and shooting without the restrictions of game laws.

On the northern portion of Asturias vast deposits of calamine, blende, and galena exist, and to some extent are being worked, finding an outlet through the small ports of Rivadeo and Requejada. The calamine is being mostly worked by the Compania Real Asturiana, who have their central offices in Madrid. Some of the blende has been worked and shipped to Antwerp, and gave on assay 64 per cent. zinc. The galena contains about 68 per cent. lead, and from 85 to 100 ozs. silver to the ton. A fair quantity of this has been shipped at Rivadeo for the lead smelting works of Messrs. Anglada Brothers, of Malaga, and is considered to be good.

Along the coast of Asturias amber is found in some quantity, but owing to the ignorance of the surrounding inhabitants it is only looked upon as fit for fuel, and used accordingly, except in very exceptional cases. Towards the western parts of Asturias there are some very fair lodes of tin, bearing abundant proof of having been worked by the ancients, but which in this modern age have not been touched. In various places in the offshoots or stirrups of the Pyrenees, towards the south, sulphurets and oxides of antimony exist in fair abundance. Samples taken resulted in the sulphurets yielding 68 per cent. and the oxides 46 per cent. of metallic antimony. The above indications could be indefinitely extended, but for the present suffice it to repeat that the whole of these districts teem with minerals and mineral wealth; the inhabitants, however, know little and care less about this; they are contented with what they have, and never think of advancing a single pace beyond where their fathers and predecessors stopped, and since they took no heed of anything else than of their flocks and herds, merely tickling the earth's surface to make her produce corn and fruit sufficient for the year's requirements, their children are quite satisfied to rest where they left off. Of course the time cannot be far distant when British

enterprise and capital will find its way into these districts. When it does the results will doubtless surprise its promoters, and be a cause of unfeigned satisfaction to everyone.

J. A. JONES.

London, July 4.

#### ORNAMENTING GLASS WITH METALS.

Sir,—Remembering that at one period, not many years since, the manufacture of so apparently an unimportant article as crinoline steel sufficed to provide employment for a class of workpeople who would otherwise have been almost destitute through the depression of the trade they had previously worked at, it occurred to me that greater efforts should now be made to find new applications for those metals the supply of which has got ahead of the demand. It is difficult to see any chance of the demand overtaking the supply under existing circumstances; but if some new application, whether for artistic or industrial purposes, could be found the case would be entirely altered. The present price of copper would appear to afford an excellent opportunity for the re-introduction of elaborate metal ornamentation, that metal being very readily made to assume the most elegant forms, and being, at the same time, admirably suited for gilding, silvering, and such like. I am led to these considerations by having noticed a series of patents recently taken by Messrs. Monot and Stumpf, of Paris, for ornamenting glass with metals. The proposition appeared so remarkable that I carefully examined the specifications, and, although I presume the quantity of metal used in this case would be very small, it shows how much can be done with ingenuity and perseverance. First, they deal with the golden bronzing of glass, their mode of treatment consisting in the employment, instead of the air or vapor by which glass is now blown in the process of moulding it, or of shaping it by hand, of a suitable reducing gas, such as pure hydrogen gas or coal gas, for the purpose of reducing metallic oxides or salts added in the composition of the glass, and thereby metallising the interior surface of the glass. This may be done of all shades or colours, according to the composition of the glass. The oxides may be any of those generally used in glass working, for instance, oxides of copper, which when reduced as above mentioned impart a golden or bronzed aspect to the glass. This metallising process may be applied not only in the manufacture of all kinds of articles of glass or crystal, but also to stained window glass, glass plaques, or tiles for mural or other decoration, reflectors, lighthouse lenses, and glass used in lighting apparatus generally.

But I think the most attractive article to which they are turning their attention is the Corinthian chiné metallique, which is produced by enclosing a layer of gold or other leaf between two layers of glass, subsequently expanding the glass so as to break up the metal into infinitesimal fragments, the result being a kind of aventurine glass, resembling the spangled enamels found at Corinth. Hitherto only one or two methods have been used for imitating this, whether the ornamentation was between the glass or on the outside only. To interpose a layer of metal between two layers of glass it has been necessary to employ two articles of glass of the same form, but of different sizes, so as to fit the one in the other for the purpose of being welded together. For example, two glass tubes have been so used, the external surface of the smaller tube being first coated with gold or silver leaf or with a metallic solution; the two tubes were then heated, and placed one in the other, the outer tube then being closed at one end and the inner tube expanded by blowing, and made to fit and adhere closely to the outer tube, so that the gold or other leaf was thus imprisoned between the two tubes. To produce the ornamental effect referred to the tubes were then heated in the furnace, blown, and expanded until the imprisoned metallic layer was burst or torn in all directions. The same result has also been obtained in another way—the glass was taken from the glass pot and formed into a solid rod or cylinder by rolling on a mangle on which has been previously laid a gold or other leaf or a layer of metallic powder, which was thus caused to adhere to the cylinder or rod of glass. The latter was then introduced into a rather larger tube or hollow cylinder of glass, and the two together taken to the furnace, and there blown to tear or disseminate the metal and produce the effect desired, after which the proper form was given to the work, and the article finished in the ordinary way. To produce the ornamental effect on the exterior of articles of glass the cylinder of glass (tubular or solid, as the case may be) was coated with metallic leaf or powder by one of the ways above described, or by sprinkling the powder contained in a sieve directly on the glass while on the blowing iron; but, instead of being then placed in an outer tube of glass, it was carried to the furnace and blown, to give the article the desired shape and produce the ornamental effect, and afterwards finished in the usual way.

It is scarcely necessary to say that the production of the articles on a large scale by these methods has been altogether out of the question. All the described processes are tedious, and more or less impracticable. In the first place, the wrapping of the leaf round the glass tube, whether hot or cold, requires very great care, and the edge of the leaf always produces upon the glass a line or streak which forms a blemish in the finished article. Secondly, the processes are very slow, because in introducing the one tube or cylinder into the other the metallic layer is liable to be chafed and torn, thereby destroying the uniformity of the distribution of the metal; then it is necessary to heat the two tubes, blow them so as to weld them together, and re-heat them with great precautions, so that the air between them shall not be imprisoned when the two are welded together. All these accidents the most expert glass worker has much difficulty to avoid, and even then he is limited by practical considerations to the production of articles of small or moderate dimensions. This fact, coupled with the amount of labour they involve, render these processes of little practical use. All these objections are avoided by the process of this invention, which consists in the employment of a bowl-shaped shell or "casing" as used in making cased glass, and in the application therein or thereon—first, of the metallic layer, and, secondly, of a mass of plastic glass which unites with the casing, the two being then blown together to produce the said ornamental effect and form the article desired.

The best effects are, no doubt, produced when the ornamentation is placed between the two thicknesses of glass. For this purpose a casing is, according to the invention of Messrs. Monot and Stumpf, made in the ordinary way by blowing a bulb of glass whilst its lower part rests in a mould of the form of the end of an egg, and then severing the glass just above the mould, leaving the lower part of the bulb, which forms the "casing," in the mould, where it is allowed to cool. When cold it is removed and coated internally in any suitable way with a layer of gold, silver, or other metallic leaf, or with a metallic solution (nitrate of silver or chloride of gold, for instance). The casing is then replaced in the mould, and they then take glass from the pot on the end of the blowing iron, blow it to a small bulb, and press it in the casing with the aid of the blowing iron until the plastic glass adheres or becomes welded to the casing, without leaving any airspace between the two. The metallic layer being thus imprisoned between two layers of glass the whole is then removed from the mould and carried to the furnace, blown, and moulded to the form of the article desired, which is afterwards finished in the usual way. By blowing, the bulb of glass and its enveloping casing become expanded to such an extent as to burst or tear the metallic layer into particles or spangles, which are thus disseminated in the body of the glass, imparting to the article the decorative effect designated "chiné metallique genre Corinthien." Or the metallic coating or layer may be applied upon the external instead of on the internal surface of the casing, and glass taken from the pot be introduced and merely pressed therein, as before, by means of the blowing iron, to make it adhere or weld itself thereto, the whole being then dipped in the pot. The metal coating is thus imprisoned between two layers of glass, which is then blown to produce the spangled effect desired, moulded, and finished. If it is desired that the metallic ornamentation should remain upon the external surface of the article the metal is applied upon the outside of the casing, into which glass is then introduced from the pot, and by pressure caused to adhere or be welded to the casing. The glass is then carried to the furnace, blown to tear or disseminate the metal, moulded, and finished.

By the above means uniformity in the distribution of the metal



is obtained, which is not liable to be destroyed by the subsequent operations; air bubbles are avoided, and the union of the two layers which imprison the metal does not necessitate that they should be previously adjusted approximately the one to the other, as it is effected by simply introducing a mass of soft glass of any form into the casing (to the shape of which the plastic glass readily conforms), and merely pressing on this mass, neither of which operations requires particular care on the part of the glass worker. Lastly, the use of the casing has this advantage over the use of tubes or cylinders, that with the latter there is a great difficulty in making articles beyond a certain size, whereas with the former articles both large and small may be made with equal facility. The ornamentation may be still further increased by metallising the internal surface, as already described, and also by crackling the outer surface.

Paris, June 28.

ALPHONSE.

## MALLEABLE BRONZES.

SIR.—It was recently suggested in the *Mining Journal* that the best way of bringing about an improvement in the price of tin and copper was to create a larger demand for those metals by finding new applications for them. This would, perhaps, be difficult; but I see no reason why they should not be more largely used for the purposes to which they are already applied. It is well known that the alloys of copper and tin, commonly called bronzes, are not capable of being worked under the hammer, rolling mill, or stamps, and have, therefore, hitherto only been cast in moulds. A French chemist—Mr. P. Dronier, of Paris—has invented a process by which such alloys are rendered perfectly ductile or malleable by admixture therewith of a small percentage of mercury, the proportion of which may vary from  $\frac{1}{2}$  to 2 per cent. In this operation the mercury does not appear actually to enter into the composition of the alloy, its effect being rather a mechanical than a chemical one, and it would seem as though this metal, assuming as it does a vaporous condition at a comparatively low temperature, and being disseminated through the liquid mass of the molten alloy, affects the opening up or separation of the molecules, so as to facilitate the penetration of the tin into the copper, thereby producing a more intimate alloy of the two. For effecting what he terms the mercurisation of the alloy the mercury may either be first added to one or other or to each of the two metals separately, being thrown into the molten mass and then stirred up, or it may be mixed with the copper at the same time as or immediately after the introduction of the tin. Good results have been obtained by mixing the mercury with the molten tin in the proportion of 1 to 2 per cent., and then adding this mixture to the melted copper.

The alloy produced by these means is perfectly malleable, and can be rolled, stamped, drawn, chased, and in short treated by any of the processes to which other malleable metals can be subjected. The alloy is by the addition of mercury rendered harder, more elastic, resisting, and sonorous, and is particularly adapted to the manufacture of musical instruments that have heretofore been made of brass, copper or silver. Being less oxidisable than the ordinary bronze it is applicable with advantage for the apparatus required in the manufacture of sugar and stearine, in dyeing and similar processes. Mercury may be added as described not only to such bronzes as are simple alloys of copper and tin, but also to those in which other metals enter along with copper and tin for the purpose of rendering them more malleable.

July 9.

STANNUM.

## SAFE LIGHTING OF MINES.

SIR.—During the last 12 months many lives have been lost by explosions of fire-damp in collieries. There is no sovereign remedy to prevent accidents, but many things may be done that would prevent some which are left undone. I venture to ask your readers to calmly consider whether in many cases their existing system of lighting may not be improved so as to ensure less risk in the hazardous occupation of coal mining. Past experience has demonstrated in a most remarkable and forcible manner that it is beyond the power of man to keep the collieries in all cases free from gas. The manager may have the most anxious and humane desire to carry out the spirit and letter of the Mines Regulation Act, but he is so frequently thwarted by the neglect of others, the carelessness and, in many cases, wilful neglect of those under him, that it is a matter of impossibility to provide against all accidents. Then, again, there are the natural causes which may arise at any moment, against which no human being can provide unless he be gifted with foresight.

It is not my intention to go into all the different known methods of working mines, but to, as far as possible, confine my remarks to the question of a safer system of lighting collieries. It will, I think, be admitted that an explosion of gas could not take place without the presence of two agents—gas mixed with air, and a flame. Without a flame light mines could not be worked, and it is the only known means of detecting gas, for which it has such an affinity. Fire is not to be played with, or the result is sure to be disastrous in the end. This knowledge incurs an amount of care in our daily use of it for household purposes. This being so, how much more necessary it is in collieries. Should fire come in contact with explosive gas ignition follows, hurrying into eternity the souls of those in the vicinity. The use of naked lights is a source of accident nearly every week. The so-called safety-lamps cause most serious and deplorable results, and are only safe under ordinary conditions, even when perfect and not tampered with. But if placed under a pressure of gas slightly above the ordinary force their safety is but a myth. Then the plan of securing them is of so simple a character as to become a parody on the word locked.

The recent disaster in Scotland was reported as occurring in spite of the extra precautions taken, one of which was the use of "locked" safety-lamps. Further search disclosed a state of things which showed this precaution was futile. Little ingenuity was required to open a lock of the character in use at the colliery referred to, and at many others. It may be said that however safely locked a lamp may be it does not prevent matches being taken down the pit. I feel sure, however, even this might be prevented to a very considerable extent. The penalty to a collier when discovered taking matches down a pit is inadequate. The punishment awarded to men in cases of an assault (an offence to my mind far inferior to that of those who jeopardise the lives of their fellow-workmen) is far more appropriate for the latter offence, and if six or nine months hard labour was given it would act as a deterrent. A system of award for the detection of the offender, and searches at unexpected times would minimise this difficulty to a great extent.

To provide for the security of the flame lamps should be self-extinguishing, with a seal or means of detecting any attempt made to open them. The construction of the lamp should be such as, whilst giving the best of lights under the circumstances, would, if submitted to a pressure of gas, or surrounded by an atmosphere impregnated with gas, inevitably make the light go out, and render it an impossibility for the light to exist under the conditions. Better be left in the dark than to run the risk of an explosion.

It is often said that the use of safety-lamps would lead to carelessness regarding the ventilation, but such a lamp as described would cause the ventilation to be carefully looked after, otherwise the flame would be materially interfered with, and show unmistakably the want of oxygen to support combustion, or when slightly charged with gas produce carbonic acid gas, which if unable to escape would soon smother the light. I could give many cases where explosions have been caused that are really preventable, and regret to say the disasters that have so occurred do not act as a warning, and cause those whose duty it is to take such steps as would prevent a recurrence of similar accidents. Many who are startled at the onset soon relax into a state of "go on as before." Take, for instance, the case of collieries where the Davy lamp has been found insufficient to stand the force of a pressure of gas, and where it has been found beyond a doubt that the flame has passed through the gauze, or become so hot as to ignite the surrounding atmosphere.

Other collieries in the immediate neighbourhood, and which are just as liable to a similar state of affairs, still continue in the old way, merely because the men are more accustomed to the Davy. Far be it from me to say a word against the Davy lamp, which I consider in the hands of a man who thoroughly understands how to

use it a most valuable lamp, and that it has certainly saved the lives of thousands. Sir Humphry Davy knew perfectly well how far it could be trusted, but he would, I believe, were he alive, endorse the opinion that it is a most undesirable lamp to place in the hands of a number of men and boys, taking into consideration the extent, depth, and vast development of coal mining. Again, the cases that are constantly appearing of lamps being tampered with, and narrow escapes reported in the different papers. If lamps are so easily opened, why not take steps to prevent it? Surely the lives of men are more valuable than the thousands of articles that are locked up. Yet in the former case the arrangements for and means of locking lamps are such as we do not consider sufficient to secure the most trifling article we value.

For a number of years experiments have been made, papers read, discussions taken place, and your columns occupied with letters referring to patents taken out for safety-lamps, still, with one exception, no success has attended the effort to improve the lighting of mines beyond what existed 15 years ago. I can only account for this for want of some reliable standard to work to. The variety of opinions respecting what a lamp should do is perfectly bewildering, often being diametrically opposite to one another. Comparisons of different experiments give the most contradictory results. Discussing the subject frequently ends in "straining at a gnat and swallowing a camel." The anomalies arising from custom in the treatment and uses of lamps are as varied as the colours of the rainbow. The reasons given for not making a change are as curious as they are numerous.

The investigations undertaken, or I should say intended to be undertaken, by mining institutes are, with certain exceptions, lost sight of in the lapse of time. A very large book might be written bearing upon the question. The main point I wish to draw attention to is that improvement can only take place by action, and it with the hope that others will take up the question I write to you, so that the standard of excellence may be arrived at. The Royal Commission now sitting will, no doubt, consider the question, and may possibly cause experiments to be conducted, but even if this should take place no harm can possibly arise, if you will, as you have invariably done, kindly allow your columns to be used as a medium and a means of ventilating the subject.

Many of your readers can give valuable suggestions which may lead to a safe system of lighting being adopted. Although it will not prevent all accidents, it may lessen those such as arise from preventable causes in connection with the lighting question.

Worsley, July 9.

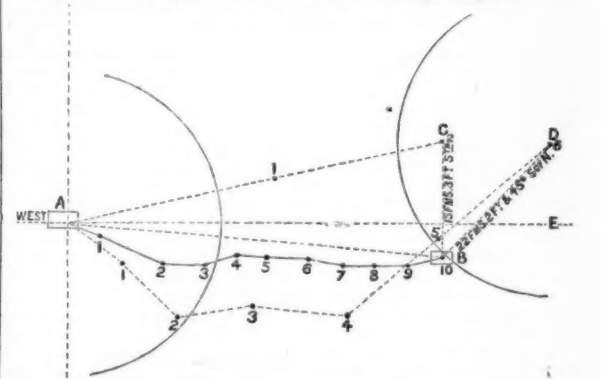
W. E. TEALE.

## CORNISH MINE MANAGERS—DIALING.

SIR.—Having during the last 30 or 40 years observed the defective and uncertain method practised in the dialing of the Cornish mines, and that apparently a proper or scientific use of the dial is a thing almost, if not altogether, unknown within the mining circle of the county, I beg that, with your wonted kindness and courtesy, the interest which you have invariably manifested in the mining industry of our country, and your constant endeavour to promote not only the welfare of mining itself, but also of all who are therewith connected, you will in your next issue of the *Journal* grant me space for this letter, and that you will kindly publish it, together with its accompanying diagram. Having said this much, let me, without making any prefatory remarks in reference to the subject of my letter, at once be "up and at 'em," and tell them what they should know to be their duty, and be capable of discharging it without the necessity of even a suggestion from me, or from anyone outside the pale of mine management. That they do, however, know their duty, and are competent to perform it, seems up to this time to be just as doubtful as in the darker ages, when mining was young. If such be not the case, why do I see even now, so late in the nineteenth century, the land surveyor is employed to do the dialing in the Cornish mines? A land surveyor to dial a mine for the manager! Is it not derogatory, degrading, and contemptible in the manager of a mine that he cannot do his own work, the work which pertains to his vocation; but that he is under the painful and humiliating necessity of employing foreign aid? I am fully aware that in an extensive run of mines the manifold duties of the manager will preclude the possibility of his attending to all the dialing, even should he be capable of doing it, but in such a case a practised and scientific dialer is frequently kept. Under ordinary circumstances, however, dialing is a duty which devolves upon the manager, and he is responsible, or should be, for the accuracy, for the result, as to the conduct of the subterranean operations of the mine of which he is in charge, and should, therefore, permit no one but himself do any important course of surveying. It is a part of his duty; besides, dialing, even in the ordinary way, done and studiously mapped by himself will attract and arrest his attention, enlighten his understanding and strengthen and confirm his judgment relative to the various phenomena which will pass under his notices, which are inseparable from mining, and which are known, judged of, and appreciated only by the experienced miner infinitely more than if done by the land surveyor or any other person, however carefully and accurately the work may have been done. Then why does he not do it? The simple answer is because he cannot; hence he is devoid of one of the principle qualifications which the manager of a mine should possess, and without which he is unfitted for his situation whoever he may be, and is not worthy of it. As before said, to do the work which he should do himself he employs a land surveyor or civil engineer, a man destitute of all knowledge of mining and its phenomena, and whose surface surveyings have not necessitated the observance of that extreme degree of accuracy required in the expensive and intricate operations of mining. The writer some years ago saw on the table at Wheal Seton account-house a small plan of a "rise" that was intended to meet a "winze" which had just then been sunk from the level above, but instead of meeting the "rise" had passed up beyond the bottom of the winze, so that they had to drive a short distance in order to effect a communication! This was the work of a land surveyor, who was paid two guineas a month to do the dialing of the mine! I requested them to put the plan out of sight, and they did so. "What the eye do't see the heart won't grieve at." The adventurers have to pay for it, and so they have for all similar work hired to be done, whether well done or not, and which it is solely the business of the manager to do. It is not, however, difficult to conceive that he finds many of his other performances much more pleasant and agreeable to human nature than the underground dialing of a deep wet mine, but as the latter is a duty which exclusively devolves on him, though not always pleasant, he should first learn to do it, and leave the more desirable part of the business, such as the driving about in his carriage, until after. In the juvenile days of the writer the employment of a land surveyor in mines was never heard of; it seems to be a thing of comparatively recent importation. The managers of mines used to manage—defective and original as their *modus operandi* might have been—to do their own work, but now-a-days the land surveyor is in frequent requisition by the managers of Cornish mines to do the work which it is their own duty and should be their interest to do, and seems to be considered by them in cases of peculiar difficulty, uncertainty, and of emergency as a personage of high and weighty authority. It is but two or three weeks ago that I was informed that one of the most prominent of them (?) had held a consultation with the land surveyor as to the existence or non-existence of a certain lode which was supposed to pass through the sett, and as to whether or not, in his opinion, they were likely to cut it in a long cross-cut which they had driven and were still driving with the expectation and hope of doing so. A civil engineer called in to be consulted on abstruse mining matters, and to assist the manager! Surely retrogression is the sign of the times; the result of the lapse of years. As before said, rude and uncertain as was the method pursued in dialing 40 years ago, no proper or scientific system having then been known within the mining circle any more than now, yet the managers did their own work, rude, crude, and uncertain as was their mode of doing it. To dial then as well as now was taught by the other. Capt. Dick taught Capt. Tom, Capt. Tom in turn taught Capt. Jack—i.e., the grandfather taught the father, the father taught the son, and the son teaches the rising generation. Thus, then, have we their rule of thumb,

bungling, uncertainty, and ignorance handed down to us, as it were the family heirloom, and which are perpetuated from generation to generation. From the necessity of seeking outside assistance it would appear as a certainty that the days-of-yore rule of thumb bungling was still in use, a part of which is the tracing of the dialling—the going over the underground angles and measurements. For this purpose a level field somewhere within reach was sought; or otherwise it was traced from the top of a vertical shaft, whence the underground dialling was commenced. Here, book in hand, the underground work would be traced from beginning to end, but frequently the surface of the ground was so rugged and unequal that the tracing of the underground dialling with any degree of certainty was impossible, and under the most favourable circumstances tracing in this way is fallacious and uncertain. This tracing was the method in general use; mapping was known but by few.

Some years ago I assisted the manager of a mine in some dialling which he required to do. We began underground from a certain vertical shaft, and having finished we came to the rugged and unequal surface, where he from the top of the same shaft, book in hand, began to trace his underground operation. After some time a house in the way interrupted his progress, when he at once turned across the course, and in that direction requested me to take the measuring line. I asked him what he was going to do that way? and said I did not remember of our having gone in that direction underground. "Going to do. Why going to borrow a draught to be sure. You wouldn't have me to look through the house, would you?" This draught borrowed, and the house cleared, he proceeded for two or three draughts with his tracing as before, when he again crossed, but in the direction directly opposite to that of the first crossing. Again the question—"What are you going to do this way, captain?" "Do; why pay back the draught which I borrowed, to be sure. If you borrow a sovereign of a man you must repay him, mustn't you?" To this, of course, I assented. My friend's procedure formed a part of the bungling system (a system if it may be so called) which it were to be desired and hoped had long since become antiquated, and that it had dropped into desuetude and oblivion, but I fear it has not. A competent dialer, whether he can "look through a house" or not, wants not to borrow a draught, neither would he require to do so, although he were to dial hence to the antipodes. If he cannot go one way, or in one direction, he can go in another; no borrowing, no tracing required. He can measure and ascertain the height and distance from him of any object which can be seen through the sights of his instrument. I may observe that before I was half an hour with my friend employed in the dialling he said to me—"You can do it better than I can." Perhaps I could; at any rate, with greater certainty of being accurate, for I was at that time well up in trigonometry. If there be anyone (and I fear there are still many) who knows only the rule of thumb (the bungling hoary headed plan), and who would wish to improve upon it, if he will be pleased to look at the accompanying diagram, and to read the explanation given in the remaining part of this letter, he will see that a better method can and should be adopted.



The diagram represents a supposed piece of dialling, the object of which was to ascertain the spot at which a vertical shaft should be sunk in order to communicate with a certain place underground—the place at which the underground dialling ended. The dialling as indicated by the respective draughts taken, and which, as seen, are numbered from 1 to 10, was begun at the shaft A, and ended at the desired place, where the new one should communicate, as shown by the letter B. The work underground completed I come to "grass," and there, instead of following my friend's tracing principle, go to a table or a drawing board, and on a sheet of paper simply delineate or map it, by which I find the distance from A where the dialling was commenced to B where it ended is 46 fms. 2 ft. on an angle of 6° to the south of east. All which now remains to be done in order to find the exact spot for the new shaft is to take the dial to the old one at A, turn it about until the needle indicates 6° to the south of east, and on that angle—looking through the sights of the instrument—measure out 46 fms. 2 ft. But on reaching the shaft I find the view between the two points so much obstructed that the sight cannot possibly be taken. I know from the operation underground that my work was easterly, and from my mapping I know exactly the distance and bearing of the place at which it ended, but the view between the two points indicated being obstructed how am I to find the place for the new shaft? Why, find my way thither by simply running the dial over the surface, going any way, in whatever direction as indicated by the dots—the drafts on the south side being numbered from 1 to 6—until I arrive as I suppose at some place whence the spot for the new shaft as shown can be seen. It will be seen that in the present instance I start for my surface dialling from A, southerly, taking altogether six draughts, and end at D, considerably to the north of the place for the shaft as indicated by the map, but no matter—I am merely feeling my way. From this place D it looks as though I could have made shorter work of the surface dialling, and have arrived easier at my object on the other or north side. I will try it. I do so, and find that two draughts bring me to C. I now again repair to the table, and as directed by my book map also the surface dialling, as indicated by the dots in the diagram, by which I find the distance from D to the termination of the underground dialling, or to the spot for the new shaft, is 22 fathoms 2 feet on an angle of 45° south of west, and that of from C to the same 15 fathoms 3 feet due south. It will be noticed that had I at first taken the north side I could have accomplished my object much easier, and that the work on the south side would in that case have been avoided, but I show the divergence in order that the reader who may be unacquainted with the matter may see how that place may be found from whatever direction he may go, or have gone, in search of it.

Well, having mapped also my surface dialling, and having left a mark—a pin driven into the ground—at each place, the end of the last draught, I must take the dial to one of them in order to find the exact spot for the shaft. I go then to C, and in the direction due south by the needle measure out 15½ fms., which takes me to the end of the underground dialling, or to the place for the new shaft. There is no tracing, no bungling, no rule of thumb in this, all is simple, plain, and easy, and no less scientific and certain. Or if you choose, having any knowledge of trigonometry, you can take a sheet of paper, sit down, and calculate your work arithmetically. All dialling done with any idea as to accuracy should be done through the medium of the quadrant, which should never be removed from the dial but to be placed in its box, for there is seldom what is called a level in any mine that has not a rise of at least 15 minutes, which in a long course of dialling makes a considerable difference, and many of them have a rise of a degree or two. As to the surface, it may be said that it is never perfectly horizontal, unless made so on purpose; notwithstanding, I do not remember that ever I saw the quadrant used either at the surface or in levels underground in Cornwall.

Leet, Sir, you should think me too prolix, I must in what remains



to be said endeavour to be brief. What I have hitherto said has referred only to horizontal dialling. I therefore, in conclusion, beg to call your attention to vertical. If required to sink a shaft on an eminence—say, a mountain—to meet a level (say) for a tramway at its base, the only mode that ever I saw employed in Cornwall to ascertain what would be the depth of the said shaft and the length of the said level was the painful and dilatory one of scrambling up its scraggy sides dial in hand, and measuring the whole of the ground by separate draughts! I have said that a proper dialler can with his instrument measure whatever object he can see. This assertion is a true one. I once accompanied "an eminent mining authority"—it was not in this country—a Cornish gentleman, of course, to a place where he had to make a measurement as above described. We arrived at the place, partially ascended the mountain, sauntered about, uselessly spent the afternoon and the greater part of the next day, when my friend hurriedly snatched his dial, and began to descend. "Whither are you going?" I asked. "Going about my work to be sure, otherwise I shall not finish to-day." I drew his attention to the part of the mountain above us, and said—"You do not mean to ascend that, do you? Why a chamois could not stand there. Sit down and be at ease. By-and-bye, when we reach the foot of the mountain, we will alight from our horses, and I will, from there, do all your work in five minutes." "Pray don't be joking; let me be about my work." "I am not joking, but serious. I will do so." "If you are serious, then, how can you do it from there?" "On the principle by which the Antarctic navigators are enabled to tell us of the bearing, height, and distance from them of land which they saw, but which they could not approach in consequence of floating ice, but in your case I will adopt another and somewhat more simple mode. On reaching the foot of the mountain I will take a sight thence to an object on the summit, which, for example, will be on an angle of elevation of 35°. From that place I will carefully measure back, in a direction directly opposite to that in which I took the sight (say) 100 yards, and thence take a sight again to the object on the summit. The angle of elevation from this place will, as a matter of course, be much smaller—say, of 25° or 27°. When I get home I will on a sheet of paper extend a horizontal base line, and from some place on it draw a line of an indefinite length on an angle of elevation of 35°, and then from the same point measure back on the line the 100 yards, or 300 ft., by scale, and then draw a line again of an indefinite length on the angle of 25° or 27°, as it may be, of elevation. As a matter of course these two lines—the one drawn on an angle of 35° and the other on one of 25° or 27°—will meet, and the place of meeting will represent the place of the object on the summit of the mountain, or for the shaft. From the place of meeting or intersection of the two lines let fall a vertical one, or one perpendicular to the base line, and the distance, measured by the same scale, from the point whence you sent up your line of elevation of 25° or 27° will show the horizontal distance or the length of your level, driven from the foot of the mountain to the place of communication. The length of the vertical line, of course measured by the same scale, will show the depth of your shaft. I. L.

#### SHEFFIELD PIG-IRON.

SIR.—Your correspondent, "Hiero en Lingote," seems rather to have mistaken the purport of "Observer's" letter on this subject. In writing you it was not with the intention of fathering "B's" letter to the Sheffield papers on the small amount of phosphorus in Sheffield ores, and the very great advantage likely to accrue to the local furnaces, but to give an observer's opinion that Sheffield pig-iron has nothing whatever to fear from the new processes in regard to the elimination of phosphorus. "B's" statements, apart from the exact proportion of phosphorus in various ores, is corroborated by the Times, and the result, no doubt, will be as he says—an additional sale of 7000 tons per week from the local furnaces, such as Browns, Parkgate, Sheepbridge, &c. What I mainly wished to do was to draw attention to the fact that there is now much distress in Sheffield, caused by the rotten companies having gone to the wall, and that the shares of very sound affairs, paying 5½ and more per cent. on present prices, could be had. These companies are few, but they are well worth seeking up, judging that if they pay well now they must do splendidly when good times return, and there is the increase of 7000 or 8000 tons a week divided amongst a few concerns. There is no doubt the worst is over. The bankruptcy of rotten works has made it better for the old well-managed concerns, and there are evident signs that our financiers and civil engineers are getting back into their former run of business.

During May over a hundred new joint-stock companies were registered. Foreign railways have had very fair amounts of capital subscribed to them in reply to their advertisements; and during the week we see in the local papers mention made of a new line from Barnsley to London, and there appears to be more than one line projected from Huddersfield to Hull. These are very large undertakings, and are followed by a number of others of minor degree. These matters have been digested and promoted by the best business men of the country, and their clear heads predict, and are acting for, the return of better times. Take the Sheffield and Rotherham Independent of Saturday last and you will find it stated that "The Sheffield stock market remains without any fresh feature, and is singularly stagnant." Now is the time to purchase into companies having their own ironstone workings and their own furnaces. I mention Parkgate as I think it well looking up; the same with regard to Brown, Bailly, and Dixon's, whose manager, Mr. Holland, is constantly mentioned in various quarters as the leading man of his profession in the district.—July 5. AN OBSERVER.

#### IDLE MINING GROUND.

SIR.—Amongst the many mining setts upon which something more or less has been done, or still is doing, as mentioned in last week's Journal, I do not note the names of the following (possibly the names have been varied) promising mineral setts, and which, if worked with a moderate outlay and judgment by experienced agents, would probably soon be in a position to pay, even in these periods of low prices for ores. I allude firstly to Wheal Sophia, Lelant, Cornwall, adjacent to the River Tamar, and overlooking the bridge carrying the coach road from Tavistock (via Milton Abbot) to Launceston. The works (years ago executed) consisted of a shaft 100 to 200 ft. deep, an adit level some 100 ft. down (and all below was flooded), a water-course, or leet, from Tamar, and also a wooden dam some distance northward on west bank to base of hill, and at the top some very well built offices, &c. Then Wheal May (I think), in Stoke Climsland; then West Polgooth, St. Austell; then East Wheal Rose and Penhallow Moor, Newlyn; then Par; then Tre-wavas, St. Breage, Helston. Then in the Liskeard district there are Wheal Mary Ann, Wrey, Ludcott, North Trelawny. In these periods of improvements in prices of silver it seems an oversight not to try and do something of a legitimate nature to resuscitate one or more of these properties, and see what results await a medium outlay, not, of course, repeating so miserable and mischievous a mistake as was made a few years ago by discreditable adventurers, ending in pecuniary embarrassment to many, inconvenience and annoyance to all but a clique; and such is the glorious uncertainty of the law, that the leading offenders escaped not "by the skin of their teeth," but with flying colours to smile on the simplicity of their befooled countrymen. There are some likely spots (in fact, considerable areas) near Saltash of valuable silver-lead ground worthy of prospectors. Taking the county of Devon I may mention Hill Bridge Consols, Huel Betsy, and Huel Jewell, the first immediately on west bank of the River Tavy, and some three miles from Mary Tavy (through Peter Tavy), and the latter two more westerly, and on (or adjacent to) Black Down, on the road from Tavistock to Okehampton (via Mary Tavy and Lidford). Let some of the respectable mining men, local or otherwise, initiate companies in (say) 3000 or 6000 shares at 1s. or 2s. 6d. subscription per share to commence on, to be followed by other easy and not too often repeated amounts, and I doubt not but that activity would be resumed in many a too quiet corner of both counties. On two or three of those mentioned—Wheal May, West Polgooth, Wheal Sophia, and Hill Bridge Consols, the late Capt. Spargo, and your old correspondent C. S. Richardson, now of Colorado, U.S. of America, had to do with, but I fancy

very little (comparatively) was done. These days of rock borers, explosive cartridges, and sling pumps ought to offer facilities not dreamt of in those days, although only 25 or 30 years ago.

London, July 7.

WEEKLY READER.

#### FREE IMPORTATION—METALS AND ORES.

SIR.—Can any of your readers inform the metallic mining interests what steps, if any, have been taken by our Cornish and Devon M.P.s, and, indeed, other Members of Parliaments and noble lords and dukes in bringing before the Government and Parliament the enormous free importation of copper, tin, lead, &c., likewise ores, into this country, which is truly annihilating our home metallic mining industries. If the landed interests are to have a Royal Commission, it is surely high time we had a "Mineral Royal Commission."—Devonport, July 9.

A. CHAPLIN.

#### LORDS' DUES OR ROYALTIES, LAND DAMAGE, &c.

SIR.—Some few years ago, Mr. Editor, I with many others called particular attention in the Journal regarding the exorbitant royalties charged by many landowners on the produce of Cornish, Devon, and Welsh mines, as well as in the North and in the Isle of Man, &c., cautioning at the same time "if this was persisted in that inevitably half of our home mines would be closed." Since I wrote this caution I have been looking into matters, and I find that at least 65 per cent. of our mines have so closed, and perhaps now for ever. Had the landowners been liberal half this number at least would have been now working, and giving employment to many thousands of hands who are now in great distress and in want of work. Then, again, they exacted enormous amounts for rents, land damages, &c., which simply disgust shareholders in mines, and the result was resolutions passed to wind-up and abandon the mines entirely. The same question is now again agitating managers' and shareholders' minds in the midst of this fearfully depressed state of the country, and more especially in our metallic mines, which (the few that are left) are simply struggling for an existence. I think, as a rule, that most managers are doing their utmost to keep the mines going in practising economy both at the surface and underground. The poor shareholders, however, are getting no dividends, but many are called upon to pay calls. The next question is what are the landowners of mines doing? Some I am told have been and are more than ever behaving well in this day of great need, whilst some few others, it is said, are "exacting the last penny." Can this really be so? What are our mine managers, directors, pursers, or secretaries about that they cannot furnish you forthwith with the full particulars of the various rates of royalties paid, rents, land damages, acreage, and fines for renewals of leases; stating whether tin, copper, lead, &c., the names of the landowners, and the reductions they have already consented to allow in these most serious times of depression, and those who have not consented?

It is to the interest of the mining public who have investments in our home mines that they should know the mining districts in which the lords are liberal and those who are not. It is said again that many of the landowners' agents or solicitors are greater enemies to home mining interests by the advice they give their masters than the landowners are themselves. Some time ago I remember cases of this sort coming under my observation in several of the West of England mines. The solicitor, poor fellow, died some time ago, but the big agent is still living. It was notorious the conduct of these two worthies pulling the strings as they did for many years by certain exactions and by certain fees and various charges, until at length the several mines—yes, indeed, I may say scores of mines one after the other—were closed, and thanks to several landowners these two individuals were removed from their office; but, alas, it was too late, the companies were abandoned. In the present stagnation state of the metal trade and foreign competition, and our mines struggling on as they are now doing, I state it as the general feeling amongst shareholders that landowners ought to give up all royalties on the produce of ores, and that for the future they should be paid a certain fixed percentage on profits, with an acreage allowance of any land damaged. If this were carried out it would be better for landowners, as they would get additional mining ground opened out, and discoveries of ores made, and profits would follow from them.

If Cornish and Devon mining and Welsh mines, as well as the North of England, Isle of Man, and Scotch mining, is again to prosper the sooner the royalties on the produce of ores are given up the better, and a percentage of profits paid in lieu thereof. In the meantime let us have this royalty question thoroughly ventilated by informing the public who are the liberal landowners and who are not; and, if necessary, let us keep our eyes open, not only on the conduct of the landowner, but on his solicitor or agent likewise, amongst many of whom there are some excellent representatives of their employers and the mining interests generally. There is another matter I desire to call attention to regarding the miners and work-people. Great reductions are being made in wages, and possibly the lowest has not yet been reached, as it is said metals are still to go lower, owing to the great foreign production and importation. Now, seeing these wages reductions of miners, &c., I should like to know what the same landowners or landlords have done in reductions of rents for these miners during the last two or three years? There are many intelligent miners who could and would be able to inform the mining public of this through your columns, and it is to their interest that they should do this forthwith. If the boasted Cornish motto is "One and All"—let it be put fully to the test by the landowner and landlord rendering to the poor miners and mine shareholders that assistance which they have a right to expect. More anon.—July 8. PRO BONO PUBLICO.

#### THE LLANRWST MINING DISTRICT.

SIR.—Without entering into the merits of water or wind power over steam in the working of mines and the dressing of ores, it appears to me that the agents of D'Eresby Mountain, even if they have erred in over-estimating the powers of the former and the percentage of their produce, are not alone in being too sanguine, or of sometimes promising more than they can perform. In the month of January, 1876, a meeting of the Llanrwst shareholders was reported in the Journal, and Capt. Knapp estimated the ore in reserve to be worth then 27,500*l.*, and this was developed at a cost of 4000*l.*, and as soon as appliances were provided to make the ore marketable he would, he said, be in a position from its then state of development to give a profit of 500*l.* per month, or 6000*l.* per annum, and increase this profit as the development went on. Fifteen months after this, in March, 1877, another meeting is reported, and the shareholders are congratulated after, as one of them said, an outlay of 45,000*l.*, that the mine was then returning ores, and Capt. Knapp said "he was in a position to return 100 tons a month, and that next to Van the mine would be the richest mine in Wales." It was at this time that I received some half-a-dozen circulars (which I have preserved) calling my attention to these facts, and strongly advising me to purchase shares in the Llanrwst Mine (of which there were 30,000) at 4*l.* each. I did not do so, and had almost forgotten the matter, till this letter of Capt. Knapp, and his reflections upon the machinery and estimates of production of another mine, in which I am interested, called it to my recollection.

At the March, 1878, meeting, reported in your paper, no statement of the returns of 100 tons per month is given, but the reserves in the mine, with plant, &c., were estimated at 42,137*l.* Large and expensive steam machinery had been erected, 2000*l.* expended on dressing-floors, and "the mine had arrived at a state of prosperity such as very few shareholders had expected," and although it was then deplored that lead had fallen 4*l.* per ton, "regular returns were being made, and no doubt the mine would be a source of great wealth for generations to come." It was also intimated that a dividend might be expected in about six months.

Another year revolves, and at the March meeting of 1879 fresh capital was required, and Capt. Knapp thought 10,000*l.* might be sufficient for his requirements! And what was the excuse given for this great change, and the non-fulfilment of such splendid promises? Lead had dropped to 8*l.* per ton (as it had, in fact, twelve

months before), and "therefore it was impossible to attempt sales except at a loss."

But surely, Mr. Editor, the same excuse might be pleaded for failures of estimates, far less serious, in other properties, and, presuming the directors and shareholders in Llanrwst in their estimates and expectations relied upon their agent—Capt. Knapp—as throughout their remarks at these meetings it is evident they did, that agent might be a little more charitably disposed towards those who prefer water-power, even with its disadvantages, to expensive steam, and to his brother agents whose reports, honestly written, may be, at the time, do not always realise the expectations held out.

T. C.

#### PENSTRUTHAL CONSOLS.

SIR.—I was sorry to see by the report of the meeting of last week that less than 1500 shares had been the outcome of Mr. Waddington's proposition respecting the division of this sett, and active working of the two properties thus resulting. I could have hoped a more hearty response would have ensued at the *pro rata* suggestion. The shareholders must review the situation, and communicate their intention of supporting the arrangement to the secretary, and that at once, as it would be a grievous mistake to let this opportunity slip through their fingers. I note in the report of the meeting that Mr. Waddington is made to say that a 70-in. engine can be purchased for less than 1000*l.* If he should be as successful as the secretary or purser of West Mary Ann lately in getting an engine one would almost think less than 200*l.* would be ample. Perhaps Mr. Waddington had better look in at West Mary Ann office next time he is going West and enquire of the purser at Liskeard. Also, the report speaks of some 5000*l.* being required to fork the property. May it not be an overestimated sum, judging from the cost (comparatively slight) of some of the steam pumps, as at times mentioned in your Journal (especially convenient, as they can be slung), and requiring no immense weights of pitwork, as are associated with ordinary Cornish beam-engines, with expensive house, &c., requirements? The article in last week's Journal on these classes of pumps is well worthy attention by economists in these days. Those interested should also search the pages of your engineering contemporaries, and get information on the varied types of these beautifully made slingable steam pumps, and I fancy 1000*l.* (or at the most 2000*l.*) would be a liberal sum to fork the mine, instead of the larger amount Mr. Waddington mentions. Of course, this gentleman may be calculating for all the timbering, ladders, &c., which I have not allowed for, but simply for forking the water. I hope the shareholders will all do their proportion without any further delay.

London, July 7.

WEEKLY READER.

#### SOUTH POLGOOTH MINE.

SIR.—This most promising young mine has been recently set to work by Mr. Parkyn, of Roche. The mine adjoins the celebrated Old Polgooth, which turned out such a grand trump to the shareholders. I am informed that the mine is held by a private gentleman, who is interested in other mining business with Mr. Parkyn. A 30-in. rotary engine is to be erected forthwith. There are several large tin and copper lodes in the sett, which is a very extensive one. I sincerely hope that this will turn out equally as rich as the Old Polgooth Mine; I see no reason why it should not, as it adjoins the latter mine on the same lodes. The country is very congenial for tin and copper. ONE WHO KNOWS THE DISTRICT.

#### PROSPECTS OF MINING—THE BWLCH UNITED.

SIR.—Mining, like most other industries, is at present in a state of stagnation as far as the investing public go. Many there are who, although inclined to invest, are holding back to allow those who have some little faith to gain, but let those who sow reap abundantly of the rich harvest which is in store for them, and let the timorous pay for the energy thus provided. It is idle to go into the *pros* and *cons* of the causes which have led to the present depression. All are agreed that a reaction is setting in. Mining is the primary source from whence wealth is obtained, and as such will be the first to obtain its concomitant advantages; this industry is, however, just now under a cloud. It is suffering from the time of inflation, when little thought was extended to the soundness of undertakings.

Investors rushing too freely into concerns which looked the most tempting, and their hopes not being realised according to the picture they had painted for themselves, make it a *locus standi* to throw dirt upon one of the chief industries in the kingdom, and ere long I am persuaded the Government of this country will have to protect in many ways the sinews of the wealth of this island. There are in mining many honest ventures. One of your correspondents has given his opinion in your valued Journal that there is a bright future for the Bwlch United Mine, and as I happen to know something of this property, I freely endorse his views, since even leaving on one side the soundness of the concern it is a good feature that there is no promotion money paid, and the management is most economical whilst most effective. As I am invited down with others to the starting of the new 50-ft. pumping-wheel, it is my intention to visit again some of the mines in the district. TRAVELLER.

Mining-lane, London, July 11.

#### THE WEALTH OF THE WORLD—AGRICULTURE, MANUFACTURE, AND MINING.

SIR.—If the world's commerce is in its infancy, and railway traffic in its childhood, surely telegraphy is in its teens, yet all must admit the growth of each to have been most surprising, but what would have proved the expansion of railways, telegraphy, or commerce but for our mines of iron, our vast fields of coal, and our metallic mines of tin, copper, lead, and zinc ores. Our engineers and electricians engaged in all these departments are unsurpassed by those of any other nation, and when our greatly superior industry and experience are thrown into the scale the balance is far and unquestionably in our favour. We owe to the surface of the earth food and sustenance for both man and all animal life, but we owe to the sinews and products of mining the very means through which profitable out-turn can be rendered successful, and it is to mining industry that locomotion by land and sea is carried out. Without metals and minerals we should have no railways or steam ships—without metals no electricity or telegraphs—without coal we should have little or no gas—without metals no water pipes, no engines, manufactories, few bridges, docks, or implements of industry, to say nought of domestic and social conveniences, comforts, and cooking utensils. Again, what would America be without minerals and metals? The vast areas of land could not be cultivated or utilised, nor could the growers find markets for their products but for metals and coal. Again, California, Nevada, and Mexico would be nothing without their yield of gold, silver, and metals. The same may be said in regard to Australia, New Zealand, the Cape, Spain, Brazil, and South America, for wherever prosperity exists and progress becomes acknowledged there are certain to be minerals in abundance. Hence it becomes us to search for and develop to the extent of our power the hidden mineral and metallic resources and chambers of wealth known to traverse near the surface of almost every county and district of the Mother Country.

It is gratifying to learn that attention is being directed to Cornish mining, and it seems not improbable that considerable activity will soon become manifested on the banks of the Tamar. Mr. Josiah Hitchens, of wide and well recognised celebrity in respect to profitable mining in Devon, and of vast experience in mining affairs throughout almost the length and breadth of Great Britain, has taken up a silver mine to the west of Wheal Brothers, and judging from the reports the prospects are most encouraging, while success will greatly advance mining pursuits in the district. Pateley Bridge ought now to do some good. Bwlch Consols shares are in request, and the very efficient field of machinery should greatly assist rapid and economical development, as large deposits of lead ore are known to exist in advance of the deeper levels, and down to the Goginan deep adit 120 fms. below surface. Wheal Fesvor, South Condurrow, Wheal Eliza, and Wheal Agar are all favourably reported this week. Lead Era is rapidly developing; important discoveries may daily be expected. At Bodidris, the ore discovered



near the Lead Era holds good, and the prospects have improved of late. Mr. Alfred W. Thomas, who has had considerable active experience in the district, gives great attention to the practical development of the property.

R. TREDINNICK,  
Consulting Mining Engineer, Dealer in Stocks and Shares.  
38, Cornhill, London, July 11.

#### WHEAL CREBOR.

SIR,—An erroneous report has been circulated with regard to this mine and myself, and I shall feel obliged if you will allow me the opportunity of explaining the facts. I visited the mine on the 24th ult. On my return Mr. Gutierrez asked me in confidence for my opinion. I told him that the lode being charged with a considerable quantity of arsenical mudic I thought the ore would not prove to be so valuable as the agent of the mine had estimated it, and that his valuations were, therefore, somewhat excessive. To my astonishment I heard the next day that I had reported there was little or no copper in the mine, but that it was all sulphur and arsenic. I should not have taken much notice of this, but I find the matter was taken up at the meeting of shareholders, and has since been widely spread, in a manner even more detrimental to the mine. Allow me to state that I think a very valuable discovery has been made, and should the improvement hold on the mine must make good profits. I am desirous of not being misunderstood, and must be guarded in future against giving information where it may get exaggerated and distorted.

T. E. W. THOMAS.

Great Winchester-street, July 11.

[For remainder of Original Correspondence, see to-day's Journal.]

#### SALES OF COPPER ORES.

COPPER ORES SOLD AT THE CORNWALL TICKETINGS, FOR THE QUARTER ENDED JUNE, 1879.

Mines.	Tons.	Amount.
South Caradon ...	1450	£3,181 14 6
Devon Great Consol ...	2531	5,637 0 6
Mellancar ...	1610	4,709 7 6
West Tolgus ...	776	4,055 12 6
Marke Valley ...	838	2,583 10 6
Glasgow Caradon ...	500	2,125 2 6
West Seton ...	392	1,826 3 6
East Pool ...	645	1,252 6 6
Phoenix ...	235	1,227 7 6
Gunnislake Clitters ...	290	906 16 0
Bedford United ...	202	494 16 0
Wheal Crebor ...	105	487 10 0
Botallack ...	201	469 1 6
Hingston Down ...	293	332 5 6
Gawton ...	85	195 19 0
Pope's Ore ...	35	175 0 0
Ordnish and Carlyn ...	35	188 0 0
New Cook's Kitchen ...	30	120 0 0
North Busy ...	27	119 5 0
East Caradon ...	27	109 6 6
Wheal Bassett ...	29	79 15 0
Carn Brea ...	45	92 5 0
South Crofty ...	23	60 19 0
Tavy Consols ...	26	59 16 0
North Treskerby ...	10	58 0 0
Penhalls ...	18	55 16 0
South Roskear ...	8	39 18 0
South Condurrow ...	9	39 7 6
West Bassett ...	18	37 14 0
Fengelly's Ore ...	15	32 0 0
Cook's Kitchen ...	5	21 12 6
South Tolcarne ...	15	21 7 6
Penstruthal ...	1	13 10 0
Williams's Precipitate ...	1	13 10 0

#### COMPANIES BY WHOM THE ORES WERE PURCHASED.

Vivian and Sons ...	2445	£7,629 4 11
P. Grenfell and Sons ...	2110	6,562 14 9
Nevill, Druce, and Co. ...	2385	7,219 15 8
Williams, Foster, and Co. ...	1959	7,044 12 0
Mason and Elkington ...	1374	4,043 0 5
C. Lambert and Co. ...	452	1,741 8 3
Total ...	10,675	£34,260 16 0

COPPER ORES SOLD AT THE SWANSEA TICKETINGS, FOR THE QUARTER ENDED JUNE 30, 1879.

Mines.	BRITISH Tons.	Amount.
Berehaven ...	320	£1,702 1 0
Cambrian ...	58	372 4 6
Knockmahon ...	76	157 14 0
Tigrony ...	9	13 14 6
Total ...	463	£2,242 14 0
COLONIAL.		
Betts Cove ...	1451	£6,915 10 0
Emily Ore ...	21	32 17 0
Total ...	1472	£6,948 7 0
FOREIGN.		
Balade ...	825	£7,543 8 0
Vignas ...	218	5,114 13 0
Caveira ...	449	1,857 7 0
Vineberg ...	193	1,458 3 0
Alcoutim ...	118	675 2 0
Sobral ...	45	408 7 6
Total ...	1851	£215,538 0 6
RECAPITULATION.		
British ...	463	£2,242 14 0
Colonial ...	1472	6,948 7 0
Foreign ...	1851	15,538 0 6
Sundries ...	327	3,412 5 0
Total ...	4113	£28,261 6 6

#### COMPANIES BY WHOM THE ORES WERE PURCHASED.

Copper Miners Company ...	813	£4,380 13 8
P. Grenfell and Sons ...	77	1,521 9 6
Nevill, Druce, and Co. ...	19	418 19 0
Vivian and Sons ...	140	371 0 0
Williams, Foster, and Co. ...	1979	15,175 19 0
Mason and Elkington ...	276	1,857 2 0
Charles Lambert and Co. ...	84	989 4 8
Sweetland and Co. ...	234	835 12 0
Landore Copper Company ...	491	2,681 6 2
Total ...	4113	£28,261 6 6

UTILISATION OF EXHAUST STEAM.—According to the invention of Mr. N. W. ERICSON, of Stockholm, he lets steam of higher pressure, or higher temperature, or both higher pressure and temperature than the pressure or temperature, or both, of the steam which is to be used in a steam-engine or for any other purpose, pass into an apparatus for the suction and compression of elastic fluids, in order that the said higher or stronger steam may in such apparatus act as the action fluid to the said spent steam; this suction and compression apparatus is further connected with the apparatus wherein steam is to be used in order that the spent steam may to a greater or less extent be drawn into the suction and compression apparatus when the acting or higher steam passes through it. The mixture of the acting or drawing steam and the spent steam passes through the delivery pipe of the suction and compression apparatus (and its continuation, as required) either to the place where the thus compressed steam is to be used, or else first through an apparatus containing saturated steam, or water, or in so near connection with water that the steam if in a superheated state becomes more or less saturated or lowered in temperature, or else into an apparatus wherein the steam, by cooling, is rendered liquid, and the heat thereby given out is used for generation of fresh steam. This latter apparatus may be the steam boiler in which the acting superheated steam is generated, or another steam boiler or vessel. The suction and compression apparatus may be any suitable suction and compression apparatus, such as an annular or other jet apparatus.

HOLLOWAY'S OINTMENT AND PILLS.—The finest remedies in the world for bad legs, old wounds, sores, and ulcers. If used according to directions given with them, there is no wound, bad leg, or ulcerous sore, however obstinate or long-standing, but will yield to their healing and curative properties. Numbers of persons who have been patients in several of the large hospitals, and under the care of eminent surgeons, without deriving the slightest benefit, have been thoroughly cured by Holloway's ointment and pills. For glandular swellings, tumours, scurvy, and diseases of the skin there is no medicine that can be used with so good an effect. In fact, in the worst forms of disease, dependent upon the condition of the blood, these medicines, if used conjointly, are irresistible.

#### Meetings of Public Companies.

##### ALMADA AND TIRITO CONSOLIDATED SILVER MINING COMPANY.

The eighteenth half-yearly general meeting of shareholders was held at the offices, Finsbury-circus, on Friday, July 4.

Mr. W. MARTINEAU, M.I.C.E., in the chair.

Mr. J. A. MORGAN (the solicitor and general manager) read the notice calling the meeting. The report of the directors was taken as read.

The CHAIRMAN said that the last time he had the pleasure of meeting the shareholders he was in hopes that the accounts to be submitted on this occasion would have shown a rather better result than they did. He could not say that he anticipated a profit, but he did not anticipate that the loss would be quite so large. At the same time they must bear in mind that everything—the exploration of the mine, depreciation, current expenditure, debenture interest, and so on—had been written off and were included in that loss. The actual loss was 3422l. 9s. 9d. on the half-year. They had spent on exploration from what was called the exploration fund 1200l.; there had been 765l. written off for depreciation, whilst the debenture interest and English expenses amounted to 1460l., making up the amount he had mentioned. On the mines over there they had done just what Mr. Clemes, in his last report, said they would be able to do—to meet expenses. In the coming six months he hoped they would be able to do something better, because the profits which had been telegraphed and written since were such that the directors fully hoped that for the current half-year ending June 30 there would not at any rate be a loss, or at any rate a very small one. On the occasion of the last meeting a good deal was said about the ore on the waste heaps or dumps, and the directors then instructed Mr. Clemes to make a very careful estimate of that ore; this had been done. Mr. Clemes went into the matter very carefully, and dug trenches, and sunk a small shaft to ascertain exactly what the contents were, and Mr. Clemes in his report gave a very decided opinion that the net profit of working the whole dumps would be from £50,000 to £80,000. He only hoped it would turn out to be as good as Mr. Clemes estimated it. For his own part he had no doubt that the actual results would turn out much better than the estimate, for Mr. Clemes made no allowance for coming across better ore than that which he had already found. The only doubt one had in one's mind was whether Mr. Clemes could really concentrate and liquefy these ores so as to make a profit, which he anticipated, of £2 and 35 per ton. He was glad to say that during the first six months of the present year the accounts which had come from the mine had been of a more cheering character, and lead the directors to hope that they had really turned the corner. These reports had all been published and sent round to the shareholders from time to time, but within the last few days fresh reports had been received, which would be published in the *Mining Journal*. (These reports appeared in the *Journal* of Saturday last.) The important feature in the whole thing was the great improvement which had taken place in Mina Grande. There was not the slightest doubt that there was a very large body of ore there.

Mr. J. A. MORGAN explained the condition of the workings, and said Mr. Clemes had got hopes that the improvement would go down and make a permanent mine, getting richer as it went down. There were some samples coming over in a few days, which could be seen at the office when they arrived, and these would be assayed, and the results sent to the shareholders.

A SHAREHOLDER asked for information concerning the San Pedro old stopes? Mr. MORGAN said there was a large amount of ore taken from the tunnel level by the old workers, which was extremely profitable, and Capt. Morcom advised that they should rise there; that had been accomplished up to 70 ft. above the tunnel level, and it was reported that there was a large ore chamber immediately above, from which they anticipated a considerable quantity of ore, and as it was rich above there the chances were that they would get enough for a considerable time ahead. This was important, as the lode to the south-east had never been explored.

Mr. M. TAYLOR: It proves that the lode is going very good up to the slide, and there is no reason it should not be found on the other side.—Mr. MORGAN: We have a large ore chamber there, and there is a good chance of its leading to further discoveries.

The CHAIRMAN said that the discoveries which had been made since Captain Morcom went out fully justified the good report the directors had of him on his appointment. It was a good deal owing to Capt. Morcom's organized and careful working that many of these discoveries had been made. The directors hoped that as Capt. Morcom had done so well so far he would go on in the same way. There seemed to have been an impression abroad on the minds of many people that the remittances which had been coming over were all profit, and it was right that this impression should be removed. These remittances were all liable to be, and were, drawn upon on the other side for the working expenses. The metal was sent over here to be sold simply because it could not be sold there. It would be seen by the report that the schooner Providencia had been sold, and he thought that, on the whole, the sale was a satisfactory one, as she only stood in the books at 892l. 16s. 6d., and was sold for about 800l.; and considering that a loss had been made in the half-year on her working, he thought that the shareholders would agree it was quite as well she should be sold at that price, because she was no longer required for the carriage of ore to Mazatlan. In conclusion, he (the Chairman) moved the adoption of the report and accounts.

Mr. J. P. G. SMITH seconded the resolution.

Mr. MORGAN, in answer to Mr. S. J. WILDE, said there was about 2300l. for January of the present year, and for February and March it was about 1800l., and if they deducted about 1000l. for expenses in London, that would give the result as far as possible.

Mr. HENRY SWAFFIELD said he was glad to hear the Chairman speak in encouraging terms about the discoveries made in the Mina Grande and San Pedro Mines during the past few months. He had carefully studied the reports, and had formed a high opinion of the prospects of the company, as sufficient ore had been discovered to ensure good returns for some time to come. To him, personally, the improved position furnished a reward for any assistance which he might have rendered in carrying this out. About 18 months ago, at a meeting of shareholders, he stated his belief in the goodness of the mine, but said he had no confidence in the local management, and suggested that the local agent, Capt. Clemes, should be replaced by a more competent agent. For himself, he himself happened to know of a man out of employ, who had for many years directed mining operations in Spain, and having the highest opinion of his integrity, straightforwardness, and ability, he recommended the board to appoint him, and he was sent out to Mexico. It was satisfactory to know that the opinion which he had formed of Capt. Morcom had been fully justified by the results. It was much to the credit of Mr. Clemes that he gave the entire credit of the company's improved position to Capt. Morcom. In conclusion, he reiterated his belief in the greatly improved prospects of the company.

The CHAIRMAN, replying to a previous question by Mr. S. J. WILDE, said he had now before him the figures for January, February, and March, and in round numbers the profit on those three months was about 1000l.—A SHAREHOLDER: If it goes on like that it means a dividend at the end of the year.

After some further discussion of an unimportant character, the resolution for the adoption of the report and accounts was put and carried.

On the motion of the CHAIRMAN, seconded by Mr. T. EYKYN, Messrs. Fletcher and Kershaw were re-elected directors.

On the motion of Mr. JOHNSON, seconded by Mr. MEADOWS TAYLOR, the auditors, Messrs. J. Waddell and Co. and Mr. H. Swaffield, were re-appointed.

On the motion of Mr. SWAFFIELD, seconded by Mr. BUSH, a vote of thanks was passed to the Chairman and directors, and the meeting broke up.

##### ROOKHOPE LEAD MINING COMPANY.

The adjourned extraordinary general meeting of shareholders was held at the offices of the company, Austinfriars, on Tuesday.

Mr. WILLIAM EDWARDS in the chair.

The LONDON MANAGER AND SECRETARY read the notice calling the meeting.

The CHAIRMAN said—Gentlemen, you have read the report of the last meeting, and you are aware of the position in which we are placed. I very much regret there is not a larger meeting; on the last occasion I had to express myself to the same effect. This small attendance shows the directors what little interest the shareholders take in their property. If they will not come forward and assist us either to resuscitate or do something by which the property can be saved, they must not complain if we take the only step which is open to us. We must go into liquidation unless we are prepared to-day to pass some more favourable resolution. The directors have done all they possibly can in this matter to try and persuade the shareholders to come forward, but it appears they decline to do so, and their absence to-day is an answer to our question that they do not intend to do it. I shall be happy, as Chairman, to give any information I possess, and shall be glad if the shareholders will assist us by their counsel and advice.

Mr. W. WHEELHOUSE said the smallness of the meeting led him to infer that the shareholders considered it a hopeless affair. If that were the case no doubt it came to a question of liquidation. He asked whether the powers the directors possessed did not give them the power to sell without liquidation?—The LONDON MANAGER: It must be liquidation in the end. You know the way we did it before it was our property, and then the old company had to be liquidated.

Mr. WHEELHOUSE suggested whether they could not issue shares at a discount? The LONDON MANAGER: We have been advised we could not do it. I may mention we have received promises of 15000l., whereas we want 20000l., and some of those promises are conditional on the whole amount being subscribed.

The LONDON MANAGER, in reply to further questions, said the total debts were about 17000l.—Mr. WHEELHOUSE said it was very disappointing to the shareholders to see this result after the hopes which had been held out as to the value of the mine.—The LONDON MANAGER said he believed he was right in stating that Mr. Wheelhouse had himself had a report on the value of the mine, and he believed the mines were in that report valued at even a higher value than was put upon them by the company's agents.

Mr. WHEELHOUSE asked what proportion of shareholders had agreed to take the shares?—The LONDON MANAGER said there were about 200 shareholders, and only about 20 of that number had responded to the appeal of the directors and subscribed. He might mention that the directors had been doing all they could to obtain a reduction of lord's dues, and possibly if the mine had gone on those dues would have been reduced.

A SHAREHOLDER: Could we not sell one of the mines?—The CHAIRMAN: I do not think this could be done at present.

The CHAIRMAN, in reply to a further observation, said there had been pressing

claims, and from time to time the directors had advanced money to pay those pressing claims when money did not come in.—Mr. WHEELHOUSE said there was no doubt the directors had done everything they possibly could, and had shown their belief in the mine.

A DIRECTOR pointed out that if the mine went into the hands of liquidators it would be necessary to keep the mine open in order to realise it.

The CHAIRMAN said Capt. Tonkin stated the ore was there, and if they could get more capital he could carry on. Capt. Tonkin was not overdoing the thing. Capt. Tonkin went down to the mine a stranger, and in the first month he washed 27 or 30 tons of lead, and had kept it up.

A desultory conversation ensued, and there was a general expression of regret that so promising a mine should be placed in liquidation. Two or three alternative schemes were suggested. Amongst others, one by the London manager to issue 5000 B shares of 1l. each, to have the first lien on the property; but it was pointed out that as any of these schemes would take up some time, whereas some of the creditors were getting somewhat pressing, and moreover money would be wanted to carry on the mine, the general feeling seemed to be that for the protection of the property itself the best thing to be done was to place the mine in liquidation.

Eventually the following resolutions were passed:—"That, it having been proved to the satisfaction of the meeting that the company cannot, by reason of its liabilities, continue its business, it is advisable to wind-up the same."—"That the Rookhope Lead Mining Company be wound-up voluntarily."—"That Mr. W. Edwards and Mr. J. H. Murchison be appointed liquidators."

It was understood that this still leaves open the practicability of reconstructing in the event of the liquidators seeing their way to some such resuscitation being carried out.

A vote of thanks to the Chairman and directors closed the proceedings.

##### COLORADO UNITED MINING COMPANY.

The following annual report will be submitted to the meeting of shareholders, to be held on July 16:—

The sales of ore during the twelve months were—For the three months to June 30, 9159l. 12s. 8d.; for the three months to Sept. 30, 6258l. 5s. 4d.; three months to Dec. 31, 8821l. 11s. 7d.; and the three months to March 30, 6717l. 16s. 5d. The company also received royalties amounting to 2837l. 18s. 4d., and rent of buildings in Colorado 1000l. total, 30,792l. 4s. 4d. The expenses during the year having been 29,702l. 14s. 10d., there remains a profit on mining operations of 999l. 9s. 6d.

When the last annual report was issued the then superintendent, Mr. Morgan, had informed the board that the receipts for May and June, 1878, had averaged 3200l. a month, and that on the completion of the concentrating works this amount would be exceeded by 1000l. a month. The mill was started in the middle of July, but from that time the receipts instead of increasing fell off considerably, while the expenses far exceeded the estimates. Mr. Morgan not having explained or rectified to the board's satisfaction his erroneous forecast and misleading statements, and having involved the company in serious financial difficulties, the board were compelled to dispense with his services, and on Dec. 28 last they appointed the Hon. William A. Hamill, of Georgetown, the largest shareholder in the company, who has had long practical experience of mining in Colorado, to be manager. He has generously offered to allow the question of his salary to remain in abeyance till the company is in a prosperous condition.

Mr. Hamill has been in charge since Jan. 1 last, and during the three months of his management not only have the receipts increased but the monthly costs and charges have been considerably less. Further progress in the reduction of the expenses will be effected by an alteration of the rate of wages paid for surface and unskilled labour.

It appears that during the administration of the late superintendent systematic pilfering of ore, to an extent seriously affecting the income of the company, was carried on by some of the workmen employed in the mine. Several men who have been arrested on this charge are awaiting trial, and stringent measures have been taken to prevent such practices in future.

The development of the mines has been vigorously prosecuted since Mr. Hamill took charge of the affairs of the company. The silver ore shaft is now below the ninth level, and the Terrible engine-shaft is being sunk, so that the ninth and deeper levels may be opened, and the reserve of ore increased. The silver ore tunnel is suspended for the present. A level is now being pushed from the tunnel towards the old Brown workings, the drift showing a vein of 7 in. in width, containing ore worth 70 ozs. per ton.

It will be satisfactory to the shareholders to learn that the great value of the property in the immediate vicinity of the company's mines has induced influential New York capitalists to effect large purchases, and constitute a new company. The board have instructed Mr. Hamill to accept any advantageous offer which may be made by the New York Company for such part of the Colorado United Mining Company's property as is contiguous to theirs, and as will prove a great importance in developing the mines which they have acquired. In the event of the projected arrangement being complete both parties will be gainers.

The dressing works, which Mr. Hamill found very imperfect, are now running in good order, and about 600 tons of low-grade ore are treated each month. Mr. Andrews visited Colorado in January last for the purpose of arranging matters connected with the future management of the company's property. He was prevented by severe illness from fully carrying out the objects of his mission, and returned to England on April 15.

Sir Cecil Beadon and Mr. J. Coope Davis are the directors who retire by rotation, and being eligible they offer themselves for re-election.

##### FOREIGN MINING AND METALLURGY.

The Belgian iron trade has observed with interest and satisfaction that the Belgian Minister of Finance has deposited in the Chambers a bill allowing to the Department of Public Works credits amounting altogether to 4,000,000l. The Brussels metallurgical bourse has been pretty well attended, but business has been as sluggish as ever. M. Cabany, of Malines, delivered the lowest tender for the supply of ten closed goods trucks to the Belgian State railways. The amount of M. Cabany's tender was 119l. 19s. 2d. per truck. A contract has been let for the construction of a goods shed at the West Brussels station, comprising about 375 tons of various descriptions of iron. After a good deal of competition the Scléssin Blast-Furnaces, Iron-works, and Collieries Company obtained the affair at 50077l. A contract will be let at Brussels on the 23rd inst. for the construction of the second of two swing bridges proposed to be established at Laeken, in replacement of the existing bridge over the Willebroeck canal, together with quay walls and approaches. The estimated cost is 21,064l. Reduced special rates are about to be tried for a period of three months upon the Belgian State railways for the conveyance of minerals from Athus, Halanzy, Messancy, Signeulx, and the Grand Duchy of Luxembourg, and destined for the blast-furnaces of the basins of Liège, the Centre, and Charleroi. These reduced rates are, however, only applicable to lots of a minimum of 120 tons. The Arlon Chamber of Commerce has just published a report on the position of industry in the province of Luxembourg during the years 1877 and 1878. The free workings of minerals in the Luxembourg have remained nearly stationary during the last two years. In 1877 the production amounted to 26,000 tons, of the value of 36000l.; in 1878 it rose to 33,000 tons, of the value of 37600l. The Athus furnaces consumed in 1878 172,500 tons of minerals, of the estimated value of 20,720l., coming from the Grand Duchy of Luxembourg, or more than 15 times the production of the mineral workings of the province. The production of the Athus furnaces in 1878 amounted to 56,000 tons, of the value of 116,000l. In 1877 the same furnaces consumed 171,500 tons of minerals, of the value of 20,580l., and their production of pig amounted to 52,000 tons, of the value of 119,996l. In 1877 the minerals of the Grand Duchy of Luxembourg were imported into the Charleroi and Liège basins to the extent of 650,000 tons; in 1878 the corresponding imports were 731,000 tons.

In the French department of the Haute-Marne transactions have not been without importance in almost all descriptions of iron. In castings also there has been a small current of orders. It is to be desired that this movement may continue, but it can scarcely be expected that this will be the case at this period of the year. Prices have shown scarcely any variation. In the Nord, No. 2, merchants' iron has made 64 12s. per ton, with a scale of 10d. per ton per class and 1s. 8d. per ton per number. Construction plates have realised 84l. to 84 8s. per ton. In the Loire-et-Rhône no fresh transaction of any importance has been recorded, and small current orders are less numerous than formerly. The French Railway Plant Company has just held its annual meeting. The accounts presented exhibited a net profit of 7580l. for the past year, admitting of the distribution of a dividend of 1l. 6s. per share. The imports of pig and cast-iron into France in the first five months of this year amounted to 64,000 tons, as compared with 76,000 tons in the corresponding period of 1878. The imports of iron and plates in the first five months of this year were 23,000 tons, against 26,000 tons in the corresponding period of 1878; and the imports of steel were 2400 tons, against 2000 tons in the corresponding period of 1878. The total exports of metallurgical products from France in the first five months of this year were 141,000 tons, or 12,500 tons more than in the corresponding period of 1878.

The dead season has now acquired its full development in the French coal trade. The production of the coal mines of the Saar basin (Germany) amounted in April to 345,000 tons; this total presented little change when compared with the corresponding figures for April, 1878. The production effected in May was 352,000 tons, as compared with 338,000 tons in May, 1878. Contracts were let on Wednesday for 212,000 tons of coal required for the Belgian State railways; we shall give further details next week with reference to this adjudication. M. Motiva, of Liège, has just obtained



a contract for 320 tons of household coal required for the civil hospitals of Liège at 12s. 10d. per ton. The municipal authorities of Brussels are about to make a trial of the Sugg lantern in connection with the gas-lighting of the Belgian capital. The lighting power of the Sugg lantern is said to be very great, while its consumption of gas is relatively small.

It has already been stated that several experts, representing large ironworks in Austria, were on their way to this country in order practically to test the value of the new process for dephosphorising iron, especially with regard to the quality of the steel produced. We learn from a Vienna paper that the representative of the Witkowitz Company has already returned home. He reports that the Bessemer steel which he saw obtained from phosphorus iron is entirely satisfactory in respect to hardness and elasticity, but he is doubtful whether the process will not prove too costly, at least for Austria. The cost of the process for that country will be increased by the circumstance that the patent rights for Germany and Austria have been sold to the Hörde Iron Mining Association in Westphalia, and this company naturally demands an apparently considerable royalty per ton for further concessions. In connection with the question of competition in the international market, this enhanced cost of the process abroad will seemingly be a considerable advantage to the Cleveland district.

#### ROTARY STEAM-ENGINES.

In the various types of rotary engines as heretofore constructed disadvantages arise from friction on the bottoms of the cylinders; from the escape of steam, which, acting in a contrary direction to the movement of the engine, tends to neutralise its power; and from pressure on the rotary piston, which results in a loss of power. Messrs. CORROT and FOULIERON, of Paris, therefore, concluded that an engine possessing the advantage of the rotary principle and exempt from the objections would certainly take the first rank amongst industrial motors. It is the means of attaining this important result that the inventors believe they have discovered in the engine which they have just patented through Mr. E. de Pass, patent agent, of Fleet-street. The improved engine is composed of two distinct parts; the first comprises the mechanism for annulling the pressure of the steam on the piston and on the driving shaft and its bearings; the second is composed of mechanism forming the cylinder, and which permits of springs being fitted on the piston, to secure the necessary tightness in the steam-chest. The portion of the cylinder which forms the steam-chest, and which corresponds with the straight cylinders of ordinary engines, receives the piston, which passes into a portion of the cylinder, which is slightly eccentric on all its faces, so as not to fatigue the piston, which it is simply intended to guide in its rotary movement. The cylinder being divided into two portions, separated by a block circular on its upper part and eccentric on its lower part, the piston must be kept in constant communication with the shaft of the fly-wheel; this is done by means of a piece which passes through the shaft with but slight friction, and the extremities of which pass into a groove in the axis of the lower part of the block. The connecting piece enters alternately at two points of the piston according to their position.

On the shaft of the fly-wheel is keyed an eccentric, which moves a connecting rod from right to left only. This rod carries at its upper extremity a stud, which enters the slot of the slide guide. When the connecting rod is pushed to the left it forces the pin or stud to follow its circular line, and thus raises the extremity of the slide guide. For the admission of the steam into the cylinder a circular distributing apparatus has been substituted for the slide-valves. The escape of the steam takes place when the bottom of the piston reaches the exhaust port. A backward motion of the engine can easily be obtained by placing the necessary apparatus on both sides of the cylinder instead of on one side only. When necessary two or three cylinders can be placed on one shaft.

#### IMPROVED STEAM-PUMPS.

A direct-acting steam-pump of somewhat novel construction has recently been invented by Mr. Carl Barfell, of Stargard, Pomerania, and although not patented in this country is worthy of attention. A casing contains two chambers of segmental form, in each of which is fitted fluid tight a reciprocating blade, both of which are connected to an annular piece or ring so as to move simultaneously to and fro in their respective chambers. The one chamber and its blade being of larger dimensions than the other serves as the motor engine, steam being alternately admitted to and exhausted from either side of the blade so as to impart to it a reciprocating motion which it in turn imparts by means of the before mentioned connecting ring to the blade in the other chamber, and this by its to and fro motion alternately draws in and expels the water or other fluid on either side thereof.

For regulating the admission and discharge of the steam and water to the engine and pump each is provided with a rotating cylindrical valve contained in a cylindrical chamber situated at the apex of the steam and pump chambers. Both valves are in line with each other, and are connected so as to rotate simultaneously by means of a spindle passing through both. At one end this spindle has fixed on it outside the casing a crank which is connected to a rod working through a guide. To this rod is connected the one end of a link, the other end of which is connected to a second crank on a ring fixed to the blade of the motor engine. Thus the reciprocating motion of the latter imparts a rotary motion to the spindle and consequently to the steam and pump valves by means of the above described link and connecting rod, such motion being always in accord with that of the reciprocating blades. The steam valve has two opposite recesses or channels in its cylindrical surface, one of which establishes a communication at each semi-revolution between the steam supply pipe and one of two ports communicating respectively with the opposite sides of the motor chamber, so as to admit steam thereto, as above described. The other channel in like manner establishes a communication between the second port and a chamber in the valve casing leading to an exhaust pipe, so that while the steam is entering on one side of the reciprocating blade of the motor engine it is escaping from the other side to the exhaust.

The steam-valve is not fixed on its spindle but is carried by a sleeve that can be turned on the spindle into different positions, so as to give the valve a certain amount of lead in order to cause it to admit steam to the motor chamber before the blade has arrived at the end of its stroke and thus act as a cushion. For adjusting the amount of lead the sleeve has a flange at its outer end on the face of which are a series of radial notches, into one or other of which a correspondingly formed block is made to enter by means of a setting screw in the crank of the spindle after the sleeve with its valve has been turned into the desired position. The steam valve is hollow and has within it an annular expansion slide that rotates with the valve but can be moved longitudinally within it by means of a screw spindle carried by the sleeve. This expansion slide is so formed that when advanced by the screw it is, at certain intervals of its rotation, made to close more or less the inlet orifice of the steam pipe, and so to cut off the steam supply more or less at a certain point of the stroke of the motor blade.

The cylindrical pump valve has two channels on its surface, which, like the steam valve, alternately establish a communication between ports leading to each side of the pump blade and the suction and delivery passages, so that while water is being drawn in on the one side of the blade, that previously drawn in is being expelled on the other side. The steam and pump valves being contained in one and the same cylindrical casing, they are separated by a disc fixed on the rotating spindle and fitting the casing fluid tight. This disc has opposite channels on its circumference, one of which establishes a communication between the water way of the pump valve and a recess in the casing, while the other establishes a communication between this recess and the before-mentioned exhaust chamber of the steam valve. Thus the said recess in the casing is alternately filled with water from the pump, and such water is then allowed to pass into the exhaust chamber so as to effect the condensation of the steam.

The uniform rotation of the steam and pump valves may be in

sured by attaching a fly-wheel to the end of the spindle opposite the crank. The arrangement may be employed as a motor engine or as a pump at discretion.

#### THE SCOTCH MINING SHARE MARKET—WEEKLY REPORT AND LIST OF PRICES.

During the past week there has been more business doing, but prices in most cases are not much altered. The cheapness of money, however, is in favour of prices being maintained. The Board of Trade Returns for the month of June show a further reduction in the values of imports and exports, and the only favourable way they can be looked at is that this decline is much less than the average of the half-year just ended. Perhaps trade has now become so restricted that important alterations will be perceptible till a revival sets in. When that will be possibly depends on the coming harvest; should the weather improve so that it will come up to a fair average crop, combined with cheap money, cheap food, and low rates of wages, this autumn will be a brisker one.

In shares of coal and iron companies Benhar are 2s. 6d. per share higher on the week, while Bolckow, Vaughan, A. and E. and Ebbw Vale 10s.—both lower. Benhar touched 24s., now easier at 23s. to 25s. A call of 2s. per share has been made on Tredegar A shares, payable August 1; there are 20,000 of these shares. Steel Company of Canada shares offered. Bilboa are 16½; ditto, 6 per cent. (pref.) 41. Bolckow, Vaughan (A.), 51½ to 52½; ditto (B.), 29½. Brown, Bayley, and Dixon, 10½. Chapel House, 22s. 6d. to 25s. Cardiff and Swansea, 25s. Charles Cammell and Co., 29 dis. Ebbw Vale, 25s. to 30s. John Brown and Co., 40 dis. Marbella, 25s. to 27s. 6d. Muntz's Metal, 25s. prem. Newport Abercrombie, 5s. Rawyards, 10. Scottish Australian, 35s. 3d. to 38s. 9d. Sandwell, 13½. Sheepphrie, 50½ dis.; ditto (new), 6. Staveley (A.), 90s. dis.; ditto (C.), 61½; ditto (D.), 10. Silikstone and Dodsforth, 37 dis. Thorp's Sawbush Hall, 20s. Tredegar (B.), 17½.

In shares of foreign copper and lead companies Cape have advanced 10s. per share and Tharsis (new) 7s. 6d., while Rio Tinto 5 per cent. are 35s. lower, ditto 7 per cent. 7s. 6d., and Tharsis 2s. 6d. Tharsis shares have sold from 23s. to 23½. 6s. 3d. Alamillos are 70s. Portuaria, 80s.; Linares, 88s.; New Quebrada, 42s. 6d.; New Tharsis, 10; Rio Tinto, 5 per cent., 69½; Yorke Peninsula, 1s. 3d. to 1s. 9d.; and ditto (pref.) 7s. 6d. to 12s. 6d.

Shares of home mines neglected. Aberdunant are 2s. 6d. Bwlch United, 20s. Combarn, 6s. 3d. Carn Bre, 23. Devon Consols, 40s. Cambrian, 30s. Dolcoath, 25s. Drakewalls, 7s. 6d. East Lovell, 30s. East Van, 17s. 6d. Glenroy, 10s. Great Laxey, 15½. Grogwinion, 55s. Gorsewood and Merilyn, 50s. Great Holway, 85s. Gunnislake, 10s. to 12s. 6d. Herodsfoot, 6s. Killifreth, 2s. 6d. to 5s. Penrithal, 2s. to 4s. Prince Patrick, 20s. to 25s. Rookhope, 6s. 3d. South Caradon, 50. South Condurrow, 11½. South Frances, 7½. Tankerville, 60s. Tincroft, 5s. Van, 16. West Wye Valley, 13s. 9d. West Basset, 80s. West Sino, 15. Wheel Basset, 30s. Wheel Agar, 60s. Wheel Grenville, 75s. Wheel Gribor, 55s. Wheel Killy, 7s. 6d. Wheel Pever, 9.

In shares of gold and silver mines, no important movement. Richmond remain about 8 to 8½; this week's run is \$35,000. It is said a rich discovery of gold has recently been made in the 7th level of the Sierra Buttes. The Pastorena United gold returns for June are 582 ozs., and average yield per ton 16 dwts. 14½ grs. Argentine are 3s. 6d. Almada, 5s. to 7s. Australasian, 5s. Colorado, 30s. Don Pedro, 15s. Eberhard, 47s. 6d. Exchequer, 2s. 6d. to 5s. Flagstaff, 2s. 6d. to 5s. Frontino, 47s. 6d. Javali, 6s. to 7s. London and California, 12s. 6d. New Zealand Kapanga, 6s. 3d. Pastorena, 3s. 6d. to 4s. 6d.; ditto, 10 per cent. (pref.), 15s. to 20s.; ditto, 12½ per cent. (pref.), 17s. 6d. to 22s. 6d. Port Phillip, 1s. 6d. to 10s. St. John's, 30s. United Mexican, 7s. 6d.

Prices of shares of oil companies, Young's Paraffin have advanced 2s. 6d., and Oakbank 2s., while Uphall are 2s. 6d. lower. Young's Paraffin have been firm all the week, from 13½ to 13½. Price's Patent Candles, 8½ to 9.

There is very little doing in shares of miscellaneous companies. Cheshire Amalgamated Salt, 9; Drolwiche Salt, 25s.; Earle's Shipbuilding, 24½ dis.; Milner's Safe, 7½; Native Guano, 80s.; Palmer's Shipbuilding, 8, 15 dis. In Wagon Companies shares a small lot of Scottish was done at 9½, and there are still sellers at 9½. Prices of others are—Birmingham, 12½; Bristol, 6½; Gloucester, 6½; Metropolitan, 32½; Midland, 8½; North Central, 24½; Railway Carriage, 75s.; and United States Rolling Stock, 15½. The accounts of the United Rolling Stock Company for last half-year show a sufficient profit for payment of a dividend of 6 per cent. on the preferred shares, and of 10 per cent. on the ordinary shares, leaving 800l. to be added to the reserve fund. In chemical companies' shares 'Laws' are lower, at 7½ to 8, but the preference shares are unaltered; Langdale's, 77s. 6d.; Newcastle, 15s.; Odam's, 17; and Western Counties, 12.

The following calculations show the yield per cent. on money invested at the present prices in the shares named, based upon the last average yearly dividend being maintained:—In oil companies Oakbank would yield 10, Uphall 6½, and Young's Paraffin, 6½. Scottish Australian Mining would yield 8½; Scottish Wagon, 5½; Tharsis Sulphur and Copper, 6½; ditto, new, 6½; and Val de Travers Paving, 7½.

**NORTH MOLTON MINING COMPANY (Limited).**—This company acquired the property of the old Bampfylde Company which, when properly worked, and with a comparatively very small amount of capital, will without question leave good results. It is satisfactory to know that most of the old shareholders are determined to assist, and there can be no doubt that they will in a short time be rewarded with more or less success, notwithstanding the depressed state of trade generally. The principal objects in view at present is the developing of the copper mine, and its prospects are sufficiently good to enable a purchase of the shares to be recommended at their present exceedingly low quotations.

**CWM PRYF MINING COMPANY (Limited).**—The company, formed to acquire and work the late New Tylwyd property, have decided to alter their designation from Rheidol Valley Company to Cwm Pryf Company, as above, owing to its having been originally known by the latter name. Operations are to be commenced immediately by setting the bargains to clear and secure the ground over the deep adit level. The company have purchased a lot of useful things cheap at the old mine, and in some of their approaching reports the erection of machinery will be referred to. The manager continues quite certain their prospects are that the expenditure of a small sum will open out a very large amount of profitable ore ground, from which profits, beginning at the rate of 4000l. a year, will easily be made in 15 months.

**BLUE TRINT CONSOLIDATED HYDRAULIC GOLD MINES OF CALIFORNIA (Limited).**—This company's property is considered one of the finest gravel properties in the State. It is situated near Nevada City, and consists of 490 acres, of an average thickness of 400 ft. The business of the company is the washing down of the gravel banks into sluices, where the gold is caught. For example, it would be observed they announced a clean-up of \$20,000 last week. The average yield of these operations for the last two years has been 13 cents per cubic yard, and on this basis the property will produce nearly 4,000,000l. sterling of gold. For purposes connected with an additional water supply they are at present issuing 25,000l. more capital in debentures, for sums of not less than 100l., bearing 10 per cent. interest, and repayable in 1885.

**NORTH LAXEY MINE.**—It is doubtful if many of the shareholders in the company which last worked this property will be disposed to put any more money in it. As the company was a limited one they cannot be called upon to pay anything more, and have what consolation there is in knowing their loss. The proprietor of the adjoining Glencherry Mine has purchased the North Laxey, and very kindly offers it to the old shareholders in general at a *pro rata* subscription. We cannot make much out of the circular issued containing this offer, but it is clear enough that if the old shareholders do not respond there will certainly be one, or perhaps two, bad bargains for someone to keep. Although a good deal of lead has been got out of North Laxey it has lately been so poor that there is no inducement to go on—at least, just at present. Indeed, there is no progressive Manx mine on which it is prudent to invest more capital under present conditions, excepting Langness in the south of the Island, a copper sett confidently recommended for success.

Per share.	Paid up.	Rate per cent.	Description of shares.	Last price.
10	25	5	Arundel Coal (Limited)	6
10	10	4	Benhar Coal (Limited)	24s.
100	55	25s.	Bolckow, Vaughan, and Co. (Lim.)	54
10	10	10	Cairnabre Gas Coal (Limited)	6½
10	10	4s.	Chillington Iron (Limited)	40s.
10	10	10	Clyde Coal (Limited)	35s.
23	20	10s.	Ebbw Vale Steel, Iron, and Coal (Lim.)	30s.
10	7	nil	Fife Coal (Limited)	75s.
10	10	nil	Glasgow Port Washington Iron & Coal (L)	42s. 6d.
10	10	nil	Ditto Prepaid	42s. 6d.
10	10	nil	Lochore and Caplethrae (Limited)	15s.
10	10	nil	Marbella Iron Ore (Limited)	25s.
10	10	nil	Monkland Iron and Coal (Limited)	24s.
10	10	nil	Ditto Guaranteed Preference	47s. 6d.
100	100	nil	Nant-y-Glo & Blaenau Ironworks pref. (L)	15s.
6	6	nil	Onos & Cleland Iron & Coal (L & Red.)	8s. 6d.
1	1	15	Scottish Australian Mining (Lim.)	27s. 6d.
1	10s.	15	Ditto New	17s. 6d.
Stock	100	nil	Shotts Iron	60
4	4	nil	Canadian Copper and Sulphur (Lim.)	2s.
10	7	72s. 6d.	Cape Copper (Limited)	28
1	1	nil	Glasgow Caradon Copper Mining (Lim.)	20s.
1	15s.	nil	Ditto New	11s. 6d.
10	9½	nil	Huntington Copper and Sulphur (L.)	18s.
4	4	nil	Panulic Copper (Limited)	22s. 6d.
10	10	nil	Rio Tinto (Limited)	88s.
20	20	7	Ditto, 7 per cent. Mortgage Bonds	16½
100	100	7	Do. & p.c. Mort. Deb. (Sp. Con. Bds.)	70½
10	10	17½	Tharsis Copper and Sulphur (Lim.)	32½
10	7	17½	Ditto New	16½
1	1	nil	Yorke Peninsula Mining (Limited)	3s. 6d.
1	1	nil	Ditto, 15 per cent. Guaranteed Pref.	10s.
1	1	nil	Australasian Mining Investment (Lim.)	5s.
5	5	10s.	Richmond Mining (Limited)	8½
10	8½	nil	Broxburn Oil (Limited)	13
10	7	6	Dumfries Oil (Limited)	7

1	1	15	20	Oakbank Oil (Limited)	40s.
1	5s.	15	20	Ditto	10s. 6d.
10	10	3	4	Uphall Mineral Oil (Limited) "A"	8½
10	10	—	—	Ditto "B" Deferred	10
10	8½	17½	19½	Young's Paraffin Light & Mineral Oil (L)	19½
50	25	5	6	London & Glasgow Engineering & Iron Shipbuilding (Limited)	20
7	7	10	5	Phospho Guano (Limited)	6
10	10	6	5	Scottish Wagon (Limited)	8½
10	4	6	5	Ditto New	60s.
† Interim.	† Per share.	† For 1878.	† For 1879.		

NOTE.—The above lists of mines and auxiliary associations are as full as can be ascertained. Scotch companies only being inserted, or those in which Scotch investors are interested. In the event of any being omitted, and parties desiring a quotation for them, and such information as can be ascertained from time to time to be inserted in these lists, they will be good enough to communicate the name of the company, with any other particulars as full as possible.

J. GRANT MACLEAN, Stock and Share Broker.

Post Office Buildings, Stirling, July 10.

#### EMBELLISHING METALLIC PLATES.

The decoration of sheet-iron or of tin orterne plates by printing with colours, by lithography, and by stamping is considered to be defective whichever is used, so that in the opinion of Messrs. TROTTER and Co., of Hennebont, France, a blank remained to be filled up in order to supply the numerous manufactures employing sheet-iron and tin with a product which, while presenting essentially a decoration suitable for the article for which it is intended, offers great resistance to the tools with which it is to be made, and will bear the usage to which it will be subjected. Such is the object sought and which is believed to be fully attained with the novel products forming the subject of this invention. These products, which it is proposed to term "litho-plastic iron and tin," may in fact be applied to all purposes of manufacture. The plates of iron or other metal having been polished and grained, are submitted to lithographic printing with inks non-saponifiable by acids, amongst others those having a base of wax, linseed oil, and asphaltum, or linseed oils vulcanised by the action of azotic acid, or made so that they cannot be attacked by acids by means of an addition of Jews' pitch and two or more solutions of concentrated india-rubber.

The object or impression being obtained, the parts not covered by the fatty inks are bitten in or deepened by chlorhydric, sulphuric, nitric, or nitrous acids, pure or diluted, or by any other body capable of forming with the iron a soluble combination, or by the aid of an electric current in baths suitable for this work. The duration of the action necessarily varies with the relief which it is desired to obtain and the nature of the dissolvents used. The fatty inks which have formed the reserves are then removed either by heating the plates or by dissolvents of the fatty matters. In this state the iron is submitted either to ordinary tinning or to galvanising, or to any kind of galvanic deposit, according to the use for which it is intended. The electro-chemical deposits may be applied as reserves, this application being based upon the property possessed by certain metals of not being attackable by acid, whereas the same acids act upon iron. The same lithographic composition will then give an object or impression the reverse of that obtained by the previously described process.

#### MANUFACTURE OF TIN-PLATES.

With a view to cheapen the manufacture of tin-plates, and thus permit of their sale even at present prices with greater profit, Mr. DAVID DAVIES, of Crumlin, proposes to construct an efficient and reliable machine capable of receiving the plates to be coated at one end of the molten metal bath, and conveying them through it (like sheets of paper through a printing press) for continuous delivery as finished sheets, without any intermediate process of washing or dipping. The first part of the invention consists in the application of a peculiar disc wheel, suitable in diameter to the length or radius of the bath to be used for conveying the plates to the grease or flux pot at one end through the molten metal direct into the finishing or washing rollers at the other end of such bath. The said disc wheel is so arranged as to revolve by self-acting machinery on its axis over the bath, and having its bottom edge just above the top of the molten metal, the periphery of which wheel is divided into a number of spaces to suit the size of the plates to be coated, and is drilled to receive turned pins, on which it attaches self-acting straight, quadrant, or curved figures or levers, having their outer ends projecting from the disc wheel equal to the depth of molten metal in the bath, and so pivoted as to take hold of or carry with them each plate as it passes the grease or flux pot at one end for conveyance through adjustable guides direct into a peculiar grease pot, containing the finishing rollers and washing roller box at the other end of the bath, when the plate is instantly taken hold of by the rollers, the self-acting fingers release it, and then raise immediately out the molten metal and pass over the grease pot, and so allow the next successive plate to be similarly treated and delivered. He is thus enabled to deal with six plates passing continuously through the molten metal, such rollers being not only expensive in first cost and maintenance, but are also extremely liable to get out of order, and as they expose a large surface constantly revolving in the molten metal they tend to thicken and deteriorate it. The moveable fingers on the disc wheel are made self-acting in several ways, as by springs, quadrants, tooth racks, tappets, cams, cranks, incline slides, or direct-acting pistons working in cylinders, and any such finger may be arrested in the bath at any part of its revolution to give time for the next plate in advance to clear itself.

When desirable or preferable to the using of the disc wheel for feeding the plates, a ring or rings may be used, either rigid or flexible, of similar diameter to the said disc wheel, but revolving with its bottom edge in or near the upper portion of the liquid bath. He makes a peculiar flux or grease pot at the feeding end, with self-acting apparatus to work in combination with the disc wheel, and to deliver the plates to its self-acting fingers, and he also conveys the molten metal from the bottom of a peculiar grease pot at the finishing end of the bath into such bath by means of a syphon pipe. The metal bath is made open at top, and may be open at one or both ends, having suitable flanges thereon to receive the corresponding connections on the peculiar grease and flux pots, but he does not confine himself to any special form of bath, as the said machinery or apparatus may be applied to any other kind of bath that may be preferred.

The second part of this invention consists in applying a suitable apparatus for cleansing the coated plates from metallic oxides, scuff, and other impurities that may be carried forward on the plates from the grease, flux, or metal bath to the finishing end, where he fixes the said apparatus, which consists of a duplex reversible washing roller box, formed of one or a number (by preference five) of steel or iron rollers or bars, round, oval, square, or other angular shape in section, placed inside a large hollow roller or box so constructed as to receive one central and the other four (or more or less) surrounding fixed or moveable rollers within it. This large roller or box is pierced on two of its sides to allow the plates to pass through it over or under the said central roller, on which the roller box revolves to adjust itself or be adjusted (or may be arranged to revolve without it) to the plates, or to reverse its action from top to bottom. By this arrangement the usual washman is superseded. When desirable lateral motion may be given to the washing rollers or bars, and they may be used without the roller box by fixing them in suitable end bearings so arranged for adjusting them to the plates. Mr. Davies also proposes to prepare the plates for coating by using the vapour of steam from sulphuric acid, instead of applying it in its liquid state, as now practised. This he purposes doing by placing a small quantity of such acid in a suitable vessel placed on the bottom of and inside the annealing pots containing the plates, which acid when heated in the furnace will evaporate and cause the vapour thereof to spread over the whole surface of the plates, and so precipitate the oxide formed thereon, or, if preferred, the acid may be evaporated in a separate vessel, and be conveyed through a pipe to another cylinder or vessel containing the plates to be cleaned, when it is allowed to pass through such vessel; thence by an outlet pipe passing through water for condensing it, to be used again.



OPINIONS OF THE PRESS.

"The Tables are plainly laid down, and the information desired can be instantly and easily obtained."—*Mining Journal*.

"1890 couples have been ordered by the Government, and this is but a tithe of those to whom the book should commend itself."—*Wigan Examiner*.

"The work is replete on the subject of underground management."—*M. BAKER*, Colliery Proprietor.

To be had on application at the MINING JOURNAL Office, 25, Fleet-street, London





## PARIS EXHIBITION, 1878.



GOLD AND SILVER MEDALS AWARDED for  
Steam-Engines & Boilers, also the Special Steam Pump,  
with Holman's Condenser & Compound Pumping Engine.

## TANGYE BROTHERS AND HOLMAN,

HYDRAULIC AND GENERAL ENGINEERS

CORNWALL HOUSE, 35, QUEEN VICTORIA STREET, LONDON, E.C.,

AND BIRMINGHAM, (TANGYE BROTHERS), CORNWALL WORKS SOHO.

## The "SPECIAL" DIRECT-ACTING STEAM PUMP,

WITH  
Holman's Patent Self-acting Exhaust Steam Condensers.

UPWARDS OF 12,000 "SPECIAL" STEAM PUMPS ARE IN USE.

After eight years of successful application for all purposes to which steam-driven pumps can be applied, THE "SPECIAL" STEAM PUMP STILL MAINTAINS THE FIRST POSITION IN THE MARKET, notwithstanding that it alone—of all direct-acting pumps—has been subjected to the great variety of severe tests that must be encountered in such a period of time. Some valuable improvements have been suggested in the course of a long experience, and their adoption has rendered the apparatus at once the simplest and most certain in action. There is absolutely no extraneous gear, and the steam cylinder is no longer than the pump. The valves are of easy access, and are suited for pumping fluids and semi-fluids of almost any consistency.

## Holman's Condenser

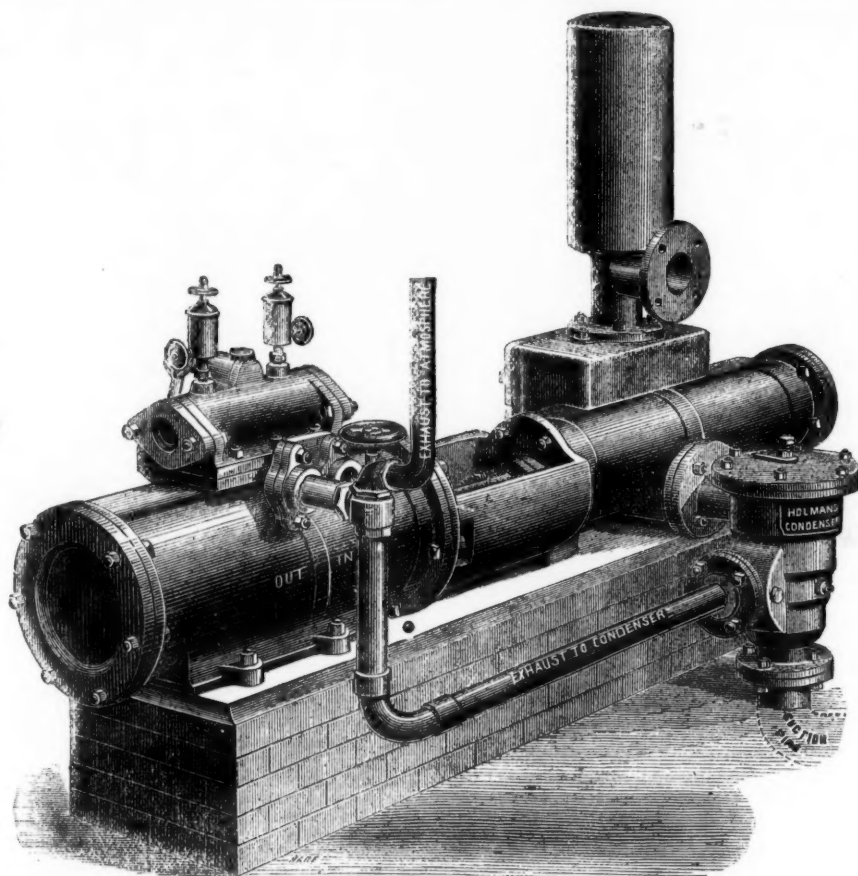
Turns waste steam into  
GREAT POWER.

SAVES HALF ITS COST IN PIPES AND  
CONNECTIONS.

PREVENTS ALL ESCAPE OF STEAM IN  
MINES OR ELSEWHERE.

REQUIRES NO EXTRA SPACE.

SAVES TWENTY TO FIFTY PER CENT.  
OF FUEL.



WILLIAM ELLIOT, Esq., of the Weardale Iron and Coal Company, writes under date Sept. 17th, 1875, as follows:—"We have now THIRTY-FIVE of your SPECIAL STEAM PUMPS in operation at the various collieries under my charge—some of them employed pumping water out of our pits to the depth of 50 fms.—others employed in the pits, and a good many feeding Boilers. I have no hesitation in saying that we have found them the Cheapest and Best Pumps of the kind we have tried. I can with confidence recommend them to intending purchasers."

Messrs. BURT, BOULTON, and HAYWOOD, Chemical Manufacturers, of London, have FORTY of the "SPECIAL" STEAM PUMPS in use at their works.

## HOLMAN'S CONDENSERS

Are made to suit any size and kind of Steam Pump. They form a part of the suction pipe of the Pump, and while they effectually condense the exhaust steam they produce an average vacuum of 10 lbs. per square inch on the steam piston, increasing the duty of the Engine and effecting a saving in fuel of from 20 to per cent.

In Mining operations these Condensers will be of great value.

All Boiler Feeders are recommended to be fitted with these Condensers, as not only is the exhaust steam utilised in heating the feed water, but is returned with it into the boiler.

## GREAT REDUCTION IN PRICES.

The following sizes are suitable for low and medium lifts:—

Diameter of Steam Cylinder ...In.	3	4	4	4	5	5	5	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10
Diameter of Water Cylinder ...In.	1½	2	3	4	3	4	5	3	4	5	6	3	4	5	6	7	4	5	6	7	8	5	6	7	8	9	5	6
Length of Stroke .....In.	9	9	9	9	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	18	12	12	12	18	24	12	12
Gallons per hour .....	680	815	1830	3250	1830	3250	5070	1830	3250	5070	7330	1830	3250	5070	7330	9750	3250	5070	7330	9750	13,000	5070	7330	9750	13,000	16,500	5070	7330
Price of Special Pump ...£	16	18	20	25	22 10	27 10	32 10	25	30	35	40	30	35	40	45	50	40	45	50	55	65	50	55	60	70	85	55	60
Extra, if fitted with Holman's Condenser and Blow-through Valve .....	£7	£7	£9	£11	£8 10	£11 10s	£12 10s	£9	£12	£15	£15	£10	£13	£15	£16	£22	£13	£16	£16	£22	£22	£16	£16	£23	£24	£35	£17	£17

CONTINUED.

Diameter of Steam Cylinder..In.	10	10	10	10	12	12	12	12	12	12	14	14	14	14	14	14	16	16	16	16	16	18	18	18	18
Diameter of Water Cylinder..In.	7	8	9	10	6	7	8	9	10	12	7	8	9	10	12	14	8	9	10	12	14	9	10	12	14
Length of Stroke .....In.	12	18	24	24	18	18	18	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Gallons per hour .....	9750	13,000	16,519	20,000	7330	9750	13,000	16,519	20,000	30,000	9750	13,000	16,519	20,000	30,000	40,000	13,000	16,519	20,000	30,000	40,000	16,519	20,000	30,000	40,000
Price of Special Pump..£	65	75	90	100	75	80	85	110	120	140	110	120	130	140	160	180	140	150	160	180	200	180	190	210	230
Extra, if fitted with Holman's Condenser and Blow-through Valve .....	£23	£24	£35	£35	£20	£27	£27	£38	£38	£50	£28	£28	£40	£40	£55	£55	£28	£40	£40	£55	£55	£45	£45	£56	£60

Intending purchasers of Steam Pumps would do well to observe the great length of stroke, short steam cylinder, and short piston of the "Special" Steam Pump, as compared with the short stroke, long steam cylinder, and long piston of the Pumps of other makers, as the efficiency and durability of the machine, and the space occupied by same, greatly depend upon this. The advantage of long strokes will be obvious when purchasers are reminded that each set of suction and delivery valves of a "Special" Steam Pump with 34 in. stroke, running at 120 ft. per minute, would open and close only 30 times per minute, as against 120 times per minute in a Pump with only 6 in. stroke performing same duty.

The "Special" Steam Pump can be worked by Compressed Air as well as by Steam.

HUNDREDS of these PUMPS are USED for HIGH LIFTS IN MINES, for which purpose they are made with 21, 24, 26, 28, 30, and 32-inch Steam Cylinders, and 36 48 and 72-inch Strokes.

The following Testimonial gives one Example of the Power Gained by the action of Holman's Patent Condensers:—

NORLEY COLLIERY, WIGAN.

Messrs. TANGYE BROTHERS AND HOLMAN.

GENTLEMEN,—I have great pleasure in recording my entire satisfaction with the working of the Holman's Patent Steam Pump Condenser which you have supplied to us. The complete condensation of the steam is, apart from its value in the fuel economy sense, a most valuable feature in the drainage of underground work-

ings. The perfect manner in which this important result is accomplished by your Condenser is extremely creditable to you, and merits the thanks and commendation of the Mining Engineer. When we start the "Special" Steam Pump the Condenser commences working automatically, and maintains a constant vacuum of 10½ lbs. per square inch, even when we run the Pump upwards of 80 strokes (106 feet) per minute. It may perhaps be interesting to you to know that when we were running the Pump at 64 strokes (106 feet) per minute, the steam gauge indicating a steam pressure of 36 lbs. per square inch, 80 yards from the Pump and the Condenser vacuum gauge on the exhaust pipe indicating a steady vacuum of 21½ inches, I turned the exhaust steam from the Condenser into the atmosphere, when the speed at once fell to 44 strokes per minute. The working economy thus shown is really so great that the cost of the Condenser must be saved in a very short time.

(Signed)

J. THOMPSON.

NORTH OF ENGLAND HOUSE  
SOUTH WALES HOUSE...

TANGYE BROTHERS, ST. NICHOLAS BUILDINGS, NEWCASTLE-ON-TYNE.  
TANGYE BROTHERS AND STEEL, Traders Place, NEWPORT, Mon.; and Exchange Buildings, SWAN



## BELTING versus GEARING.

Of late years a great change has been gradually taking place in the Mills and Manufactories of Lancashire and Yorkshire by the substitution, betwixt the Engines and Shafting, of Belting for Gearing, thus doing away with all noise and vibration, as well as wonderfully reducing the cost of repairs; and so manifest are its advantages, that driving by Gearing will soon be the exception.

As a still greater improvement, we beg to submit our Wrought-iron Drums (Rodgers's Patent), or which we are the Sole Makers. Their special merits may be briefly stated as follows:—

- 1.—These drums absorb less of the power of the engine in friction than any other mode of driving.
- 2.—Leather belts on these drums will drive considerably more than cast-iron ones, and the belts last much longer.
- 3.—These drums are not only considerably lighter in the larger sizes, but also infinitely stronger than cast-iron ones.
- 4.—In case of fire they suffer little damage. We have repaired many hundreds that have been in very serious fires, generally at about 25 per cent. on first cost.
- 5.—For MAIN DRIVING purposes they are invaluable, especially in case of a new mill, as they do not require such substantial and heavy building construction as is necessary in ordinary cases to withstand the constant vibration of gearing.



6.—The wrought-iron drums and belts are more easily and quickly fixed than gearing.

7.—Greater economy in steam power, as it requires less power to transmit the same effective force with belts than it does with gearing.

8.—Very much greater economy in subsequent repairs, as compared with gearing.

9.—The power is transmitted evenly, faithfully, and noiselessly, and without the vibration arising from defective or worn gearing.

10.—They require no cases for transport or shipment.

In support of the foregoing statements, we may say we have already supplied upwards of 20,000 of these Drums for use in Great Britain and Ireland, and have also exported them largely throughout the Continent of Europe, India, and the British Colonies.

These Drums being made by special machinery, can be made any diameter up to 24 feet, and also any width up to 4 feet, and to fit any size of shaft.

FOR PRICES OF RODGERS' PATENT WROUGHT-IRON DRUMS, APPLY TO  
**HUDSWELL, CLARKE, AND RODGERS, RAILWAY FOUNDRY, LEEDS, ENGLAND.**

SOLE AGENTS FOR LANCASHIRE, CHESHIRE, AND NORTH WALES:—WELCH AND SCOTT, MARKET-STREET, MANCHESTER.

**Awarded Gold Medal, Paris Exhibition, 1878.**

## HADFIELD'S STEEL FOUNDRY COMPANY.

FIRST PRIZE MEDALS AT LEEDS, MANCHESTER, AND  
WREXHAM EXHIBITIONS, 1875 AND 1878.

**ATTERCLIFFE, SHEFFIELD,**

DEVOTE THEIR EXCLUSIVE ATTENTION TO THE MANUFACTURE OF

**CRUCIBLE STEEL CASTINGS,**

FOR

**Engineering & Mining Purposes,**

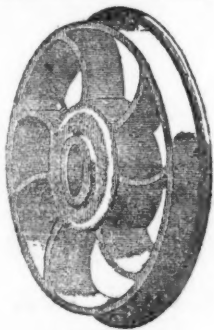
AND ARE THE SOLE MAKERS OF

## Hadfield's Self-oiling Steel Wheels

(PATENTED).

These possess advantages held by no other wheels, and are specially adapted for Collieries, Ironstone Mines, Slate Quarries, Lead and Copper Mines, &c., &c., where LOOSE Wheels are used (i. e., those revolving upon their own axles). By the old system of lubricating loose wheels, it is well known this is attended with constant labour and excessive waste; and as so little of the grease or oil applied reaches the wearing surfaces, and as re-greasing can only take place at fixed parts of the workings, the bosses of the wheels and bearings of the axles soon become dry, and cut each other: thus causing enormous wear and tear, and necessitating extra labour, haulage power, and expense. These and numerous other defects are entirely remedied by these wheels, as will be readily seen from the following illustrations and advantages claimed.

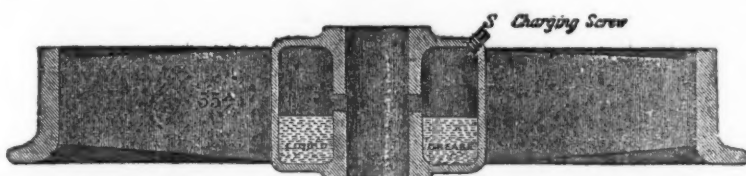
N.B.—Price per Set of Wheels and Axles (ready for use) forwarded on receipt of—1. Diameter of Wheel on tread. 2. Width of tread. 3. Diameter and total length of axle, also whether No. 74 or 75. 4. Rail gauge. 5. Rolling load.



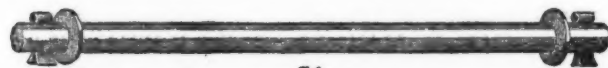
55+



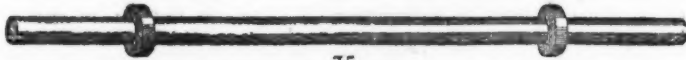
66+ Registered



Section



74



75



34+



34+



72+



35+

This Advertisement is varied from time to time.

The following are a few of the numerous Advantages claimed by the above Self-oiling Wheels:—

- 1.—Two-thirds (at least) less grease or oil is required than at present used by any known method of lubricating Mining Wagons, whether by hand, machine, or otherwise.
- 2.—These wheels effect a very great saving in haulage power; also wear and tear—being so constructed as never to allow the bearings to become dry. The revolving of the wheel leads out the oil as required, and immediately the wagon stops the lubricator ceases its action.
- 3.—No waste of grease can occur, no matter in what position the wagon may be placed, when discharging its contents (even if up side down); and when the wagons are not in use it is utterly impossible for any grease to escape, as it is all stored below the outlet (as shown above).
- 4.—When once these wheels have been charged with liquid grease (which can be done by any inexperienced person) they do not require any attention or re-greasing whatever for several weeks or even months afterwards, in proportion to the distance travelled.
- 5.—These wheels can be readily fixed to any description of either wood or iron curves now in use, whether the wheels are upon the inside or outside of the frame.
- 6.—They are exceedingly simple in construction, have no detail, and are not liable to get out of order.
- 7.—They possess great strength, durability, and extreme lightness, being made of CRUCIBLE STEEL.

Where FAST Wheels and Axles are adopted instead of Loose ones, as shown above, see our Illustrated Sheets of Drawings Nos. 2 and 3 of

**Crucible Steel Wheels and Axles, fitted complete by Hadfield's Patent Method, and Hadfield's Self-oiling Pedestals.**

**MACHINE MOULDED STEEL GEAR WHEELS OF EVERY DESCRIPTION.**



At the PARIS EXHIBITION the Jurors have Awarded  
**THE GOLD MEDAL, THE SILVER MEDAL, AND HONOURABLE MENTION**  
 FOR MY LATEST PATENTED STONE BREAKERS AND ORE CRUSHERS.

# H. R. MARSDEN,

ORIGINAL PATENTEE AND SOLE MAKER OF BLAKE'S

## Improved Patent Stone Breakers & Ore Crushers.

New Patent Reversible Jaws,  
 in Sections, with Patent  
 Faced Backs.

NEW PATENT ADJUSTABLE  
 TOGGLES.

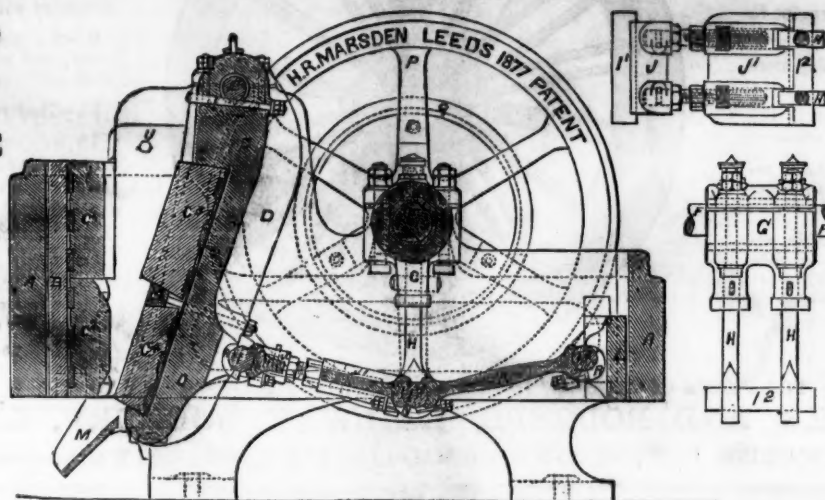
OVER 2500 IN USE.

New Patent Draw-back  
 Motion.

NEW PATENT STEEL TOGGLE BEARINGS.

70

PRIZE MEDALS.



READ THIS—

Wharfedale Lime Works, Maryport, Whitehaven,  
 November 7, 1878.

H. E. MARSDEN, Esq., Soho Foundry, Meadow-lane, Leeds.  
 DEAR SIR,—The machine I have in use is one of the large  
 size, 24 in. by 12 in. The quantity we are breaking daily with  
 this one machine is 250 tons, the jaw being set to break to a  
 size of 2½ in. We have, however, frequently broken over  
 300 tons per day of ten hours, and on several occasions over  
 350 tons during the same period. The stone we break is the  
 blue mountain limestone, and is used as a flux in the various  
 ironworks in this district. We have now had this machine in  
 daily use for over two years without repairs of any kind, and  
 have never had occasion to complain of any inconvenience in  
 using the machine. I hope the one you are now making for  
 me may do its work equally well. The cost—including EX-  
 PENSE-POWER, COALS, ENGINEMAN, FEEDING, and all EXPENSES  
 OF EVERY KIND—is just 3d. per ton. Should any of your  
 friends feel desirous of seeing one of your machines at work,  
 I shall have much pleasure in showing the one alluded to.

I am, dear Sir, yours very truly,  
 WILLIAM MILNER.

AND THIS—

Wharfedale Lime Works, Aspatia, Cumberland,  
 July 11th, 1878.

H. R. MARSDEN, Esq., Soho Foundry, Leeds.  
 DEAR SIR,—We are in receipt of your letter of 4th inst. I  
 may just state that the stone breaker above named has been  
 under my personal superintendence since its erection, and I  
 have no hesitation in saying that it is as good now as it was  
 five years ago.

I am, dear Sir, yours faithfully,  
 FRANCIS GOULD.

GREATLY REDUCED PRICES ON APPLICATION.

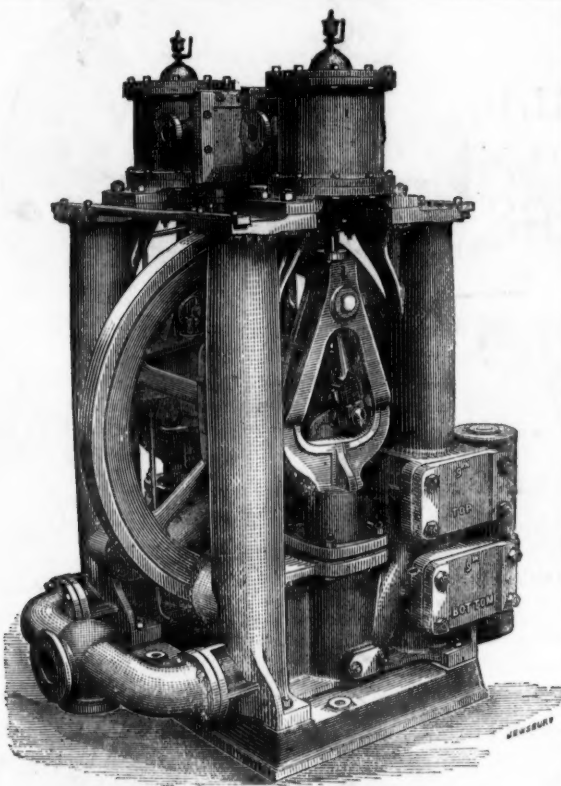
ALL BEARINGS are renewable, and made of H.R.M.'s Patent Compound ANTIFRICTION METAL.

CATALOGUES, TESTIMONIALS, &c.

H. R. MARSDEN, SOHO FOUNDRY, LEEDS, ENGLAND.

Royal Agricultural Society's International Exhibition, Kilburn, London—JUNE 30 TO JULY 7 INCLUSIVE. STAND 457.

H. R. MARSDEN will exhibit in full operation SEVERAL of his Patent Machines, Stone Breakers,  
 and Ore Crushers.



STEAM PUMPS for COLLIERY PURPOSES, specially adapted  
 for Forcing Water any height; also for Sinking; and for Feeding  
 Boilers.

JOHN CAMERON has made over SIX THOUSAND.

WORKS: OLDFIELD ROAD, SALFORD, MANCHESTER.

**SOLID DRAWN BRASS AND COPPER  
 BOILER TUBES,**

FOR LOCOMOTIVE AND MARINE BOILERS

EITHER

MUNTZ'S OR GREEN'S PROCESS

MUNTZ'S METAL COMPANY (LIMITED),

FRENCH WALLS,

NEAR BIRMINGHAM.

THE GREAT ADVERTISING MEDIUM FOR WALES.

THE SOUTH WALES EVENING TELEGRAM

(DAILY), and

SOUTH WALES GAZETTE

(WEEKLY), established 1857.

The largest and most widely circulated papers in Monmouthshire and South Wales.

CHIEF OFFICES—NEWPORT, MON.; and at CARDIFF.

The "Evening Telegram" is published daily, the first edition at Three P.M., the  
 second edition at Five P.M. On Friday, the "Telegram" is combined with the  
 South Wales Weekly Gazette, and advertisements ordered for not less than six  
 consecutive insertions will be inserted at a uniform charge in both papers.

P.O.O. and cheques payable to Henry Russell Evans, 14, Commercial-street  
 Newport, Monmouthshire.

THE NEWCASTLE DAILY CHRONICLE

(EST. 1834.)

THE DAILY CHRONICLE AND NORTHERN COUNTIES ADVERTISER

Offices, Westgate-road, Newcastle-upon-Tyne; 50, Howard street North  
 Shields; 105, High-street, Sunderland.

## THE "CHAMPION" ROCK BORER

MINE AND QUARRY STANDS, STEEL DRILLS, SPECIALLY PREPARED INDIAN RUBBER HOSE, TESTED  
 IRON PIPES, &c.



### Air-Compressing Machinery,

Simple, strong, and giving most excellent results, and  
 ELECTRIC BLASTING APPARATUS.

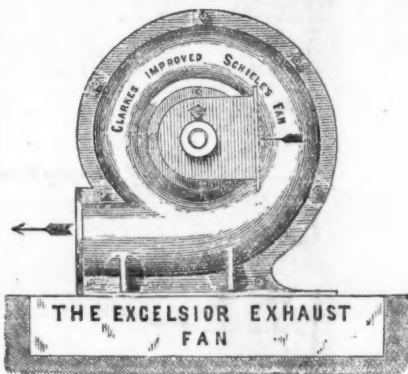
Full particulars of rapid and economical work effected  
 by this machinery, on application.

R. H. HARRIS, late

ULLATHORNE AND CO., 63, QUEEN VICTORIA STREET, LONDON, E.C.

## CLARKE AND SUTCLIFFE.

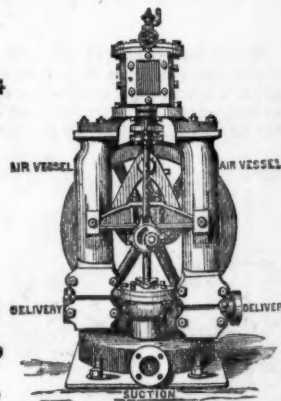
CLARKE'S SILENT FANS,  
 BLAST AND EXHAUST.  
 MINE VENTILATORS.  
 HAND-POWER FANS FOR SINKING  
 AND DRIFTING.  
 PORTABLE FORGES.  
 SHIP VENTILATORS.  
 SLATE MACHINERY.  
 SMITHS' HEARTHES.  
 TURBINE WATER-WHEELS.  
 DOUBLE-ACTING STEAM PUMP.



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